RAILROAD GAZETTE

FRIDAY, APRIL 27, 1894.

CONTENTS.

ILLUSTRATIONS:	PAGE.
Lewis Valve Gear for Locomotives	296
The Canda Platform Car.	298
The Relation of Wheels to Frog Points and to Guard Rails	298
The Gibbs Spring Controller	300
Improved Serpollet Boiler	300
New Electric Railroad Equipment	301
Harper's Ferry Improvement	301
The Hampson Flexible Iron Coupling	302
Foundations of the Chicago Stock Exchange Building	302
The Stilwell Railroad Jack	303
An Adjustable Smoke Tunnel for Roundhouses	303
CONTRIBUTIONS:	
The Right to Break Bulk	295
Turnstiles	295
EDITORIALS:	
The Use of Small Anthracite for the Prevention of Smoke	304
Another Central African Railroad	305
March Accidents	305
Electricity on Heavy Railroad Service	305
EDITORIAL NOTES	304, 307
NEW PUBLICATIONS	307
TRADE CATALOGUES	307
GENERAL NEWS:	
Bridge Building	310
Railroad Law	311
Meetings and Announcements	311
Personal	312
Elections and Appointments	313
Railroad Construction	313
General Railroad News	313
Traffic	314
MISCELLANEOUS:	
Technical	309
The Scrap Heap	310
Robert Harris	295
Trolley Lines and Track Elevation in Chicago	295
Handling Air-Braked Trains	296
Maintenance of Freight and Passenger Brakes	297
Shaft Sinking by Freezing	293
Train Accidents in the United States in March	299
Railroad Matters in Chicago	308
How to Instruct Trainmen and Inspectors About Air-Brakes	308

Contributions.

Do not forget that hereafter the address of the *Railroad Gazette* is 32 Park Place.

The Right to Break Bulk.

INDIANAPOLIS, Ind., April 17, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to your article in issue of 13th inst., headed "The Right to Break Bulk," I think your conclusions wrong because your premises are wrong, probably in error. The Muncie Pulp Co. is situated at a station called Industry, located about 1½ miles south of Muncie Station, and beyond the corporate limits of Muncie, and is directly in the line of our Fort Wayne, Cincinnati & Louisville Branch. The Pulp Co. obtains its wood from Cairo, Ill., and from Pennsylvania, and the rates from either point to Muncie is the same either via Big Four, or the Lake Erie. Until recently we had percentage agreements with the Big Four to and from Industry, which were cancelled by the Big Four; that company then, by inducements to the Pulp Co., had their wood shipments consigned via Big Four, who in turn tendered us the cars for delivery to the Pulp Co., for a switching charge of $2 per car. We declined to receive them and then the Big Four Co., through their attorneys, had the Pulp Co. bring mandatory proceedings which were granted exparte, and upon hearing dissolved. The Lake Erie has never refused to handle cars without breaking bulk to and from the Pulp and other industries. It is simply a question of compensation or division of the rates between this company and the Big Four. The Pulp Co. is not and cannot be injured in either event; their shipments are made without breaking bulk.

GEO. L. BRADBURY,
General Manager.

Turnstiles.

BLOOMINGTON, Ind., April 16, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your remarks on the use of turnstiles bring up a matter to which I have given some study, and I will venture to lay it before you.

Recently in this state many conductors have been discharged, and complaint has been made that they have no protection or means of protecting themselves against charges of dishonesty. It has occurred to me that by the use of registering turnstiles, one or more for entrance to train platforms and the same for exit, with the connecting fence, will solve the matter and furnish a method of checking accounts that cannot be tampered with. A record of the number of persons who enter a train and when they leave it will thus be readily supplied, and is, it appears to me, much more important than the supposed safeguards that attach to the present custom of requiring passengers to show their tickets to a gateman in the larger passenger stations of the country, and in them only. By the use of the registering turnstiles at every ticket station, and as well at every flag station, and by requiring the ticket agent to notify the proper officers of the road of the number indicated by the dial at the exit turnstile and also at the entrance turnstile, after the departure of each train, a complete record of the number of passengers carried between any stations on the line can be easily ascertained, and the accounts of the conductor and station agent be checked thereby. Tampering with the registering apparatus ought certainly to be prevented by skilled designers, and as tampering at one station would require tampering at some other station, discrepancies would certainly be discovered. An inspector of turnstiles, going over the line at stated times, or whenever considered advisable, and turning all registers to zero, would be all that appears to be necessary to keep them in good order. The cost ought not to be large for the necessary apparatus and fences.

BENJ. THOMPSON.

[The present system of collecting fares and tickets on railroad trains in America is so loose and unbusinesslike as to be absolutely disgraceful. This we have often said, and it is pretty generally acknowledged. It is generally believed that an effectual remedy would be very costly, and therefore matters continue to run on without change. The Chicago & Alton has made a hopeful experiment with a plan which, under the circumstances existing on many roads or divisions, seems likely to prove permanently valuable. Some other roads discipline their conductors so carefully that there is not *much* stealing; but the losses from carrying dishonest passengers because the conductor does not detect them and demand their tickets are constant and large on accommodation trains everywhere. Our correspondent's plan is worth notice as a suggestion, but it is probably too costly for adoption, and it would be disastrous to the pleasant relations between the railroads and the public. Like the sermon on chicken stealing which a certain colored clergyman was advised to preach, "it would throw a coldness over the meetin'."—EDITOR RAILROAD GAZETTE.]

Robert Harris.

Hundreds of men, former employees, business associates, or friends, were shocked last Saturday by the report that Robert Harris, Vice President of the Northern Pacific Railroad Company, died in Rochester, N. Y., at noon on that day, while on his way to New York.

Robert Harris was born in Portsmouth, N. H., in 1830 At the age of 15 he entered the navy, and was at sea for three years, most of the time serving as commander's clerk. On his return he entered the office of the well-known engineer, J. W. Brooks, afterward a long time President of the Michigan Central Railroad Company. While a very young man Mr. Harris had some service as engineer on New England railroads. In 1853 he became an engineer on the Beloit & Madison Railroad in Wisconsin, now a branch of the Chicago & Northwestern, during its construction, and in 1856 was made Chief Engineer of the Racine & Mississippi Railroad, afterward the Western Union, which has long been owned by the Chicago, Milwaukee & St. Paul. This company failed, and in 1860 Mr. Harris went to Texas, where he was for a short time Superintendent of the Galveston, Houston & Henderson Railroad, and of the Buffalo Bayou, Brazos & Colorado. The war breaking out, he made his way North and entered the army as Captain and Quartermaster, serving creditably chiefly with Burnside's Ninth Corps in North Carolina. In 1863 he resigned to accept an appointment as Assistant Superintendent of the Chicago, Burlington & Quincy Railroad, then generally regarded as the model railroad of the West. His Chief was the late C. G. Hammond, a stern Puritan of vigorous will and active conscience, and thoroughly acquainted with his business as it was understood at that day. In 1865 Mr. Harris was made General Superintendent (there were no general managers in those days), and for 13 years he conducted the affairs of that great and growing railroad system, being President in the last two years, and earned a reputation as a most skillful and successful Manager, and a man of the most absolute integrity of character.

In 1878 Mr. Harris became General Manager and later one of the Vice-Presidents of the New York, Lake Erie & Western, under President Jewett; while in that position he served for a time as President of the Manhattan (Elevated) Railway Company, chosen as a sort of umpire between the representatives of the two companies which had been consolidated to form the Manhattan Company. Each of the old companies had six representatives in the board of directors; they had very little faith in each other, and needing a man who would not tolerate any unfairness to either party, and who could not be wheedled nor bribed to permit it, they selected Mr. Harris as the thirteenth director and President, with very few executive duties.

On the first retirement of Henry Villard from the Presidency of the Northern Pacific, Mr. Harris, who had been a director of the company, succeeded him, in January, 1884. Here his duties as President in New York of a company whose lines were west of St. Paul removed him for the first time in his railroad career from the direct operating management of his railroad, and they were more of a general administrative and financial character than before, with more direct coöperation of the other directors. The immense difficulties in the way of restoring the company from its involved condition were increased by contentions among the directors themselves. In 1888 Mr. Harris retired from the presidency, but was made chairman of the board for one year. Last year, on the second retirement of Mr. Villard, Mr. Harris was again made a director and chosen Vice-President, but the property being in charge of receivers his duties in connection with the company were nominal.

For more than twenty years Mr. Harris had suffered from bronchitis, and frequently during the winter he made short journeys in mild climates for relief. About two months ago, apparently being in his usual health, he went to Southern California. Easter Sunday he wrote in high spirits announcing his early return. Friday, April 19, he left Chicago by the limited train for New York. Early in the morning he complained of a pain in his heart. His New York physician was telegraphed for to meet him in Rochester, where, about 10 in the morning he found him so weak that he had him removed from the train to a hospital, where he died at noon. His funeral was held at his old home in Portsmouth last Wednesday.

However much esteem Mr. Harris merited for his ability as a railroad manager, and he had long been counted among the first, probably every man who knew him at all well, whether an humble railroad employee or an influential director, will agree that his chief distinction was in his character. He was an absolutely just man. His chief anxiety was always to do his duty. In the innumerable negotations which railroad men have to conduct with each other, his associates soon found that there was no danger of their being overreached by Robert Harris, and it was not uncommon to allow him to act as judge in his own cause, in the assurance that he would be quite as anxious to do justice to the other side as to his own. And this passion for justice extended to the public relations of the railroad properties which he managed. He was always anxious that his railroad should do its duty to the community which it served. This character gave him the confidence of his subordinates to an unusual degree. They felt sure that their rights would be carefully regarded, and many of them, especially on the Chicago, Burlington & Quincy, where he dealt directly with a great number for many years, had an enthusiastically loyal feeling toward him, such as we sometimes see manifested by soldiers for favorite commanders.

Trolley Lines and Track Elevation in Chicago.

The question of elevating the tracks of the Chicago, Rock Island & Pacific and the Lake Shore & Michigan Southern in Chicago, to which we referred in our issue of March 30, is becoming somewhat involved by reason of the relations between the ordinance providing for track elevation and four ordinances introduced shortly afterward affecting the Chicago City Railway. The latter, which are generally known as the "trolley ordinances," provide that the Chicago City Railway may (1) lay new tracks on Sixty-third street between State street and Cottage Grove avenue, (2) lay new tracks on Wallace street between Thirty-ninth and Root streets, (3) construct a subway on Twenty-first street from State street to Wabash avenue, to carry a cable from the State street power-house to the Wabash and Cottage Grove avenue line, and (4) that the street railroad company shall be empowered to use electric power on all lines now operated by horses.

This last ordinance contemplates the use of the over head system, and as originally drawn allowed the company to erect wooden poles on each side of the street on which the conductors would be supported. These poles were to be used by the company for carrying current for other purposes, and permitted them to rent similar privileges to other parties. Poles were also to be used for conducting current from the power houses to the various lines, and no restrictions were placed upon the location of the power houses. The ordinance also permitted the company to change from electric to any other motive power at will.

The lines of the Chicago City Railway cross the right of way of the roads whose tracks it is proposed to elevate and the officials objected to a head room of only 12 ft. in subways, asserting that it was insufficient for the operation of the trolley system. An agreement was finally reached by which the head room was increased to 13 and 13½ ft., except in one or two places. For this and other considerations the street railroad company was to pay the sum of $250,000, out of which a certain amount was to be paid the railroad companies for the work required to deepen the subways the required amount.

The ordinance was passed and vetoed by the mayor. Before the matter was settled a new council was elected, and further consideration of the measure postponed in order to permit the new members of the council to familiarize themselves with the matter before taking action. Before they can act the time allowed the railroad companies for acceptance of the track elevation ordinance will expire, and as there is no provision in the track elevation ordinance for reimbursing them for the extra work in deepening the subways, their action is problematical. It is probable, however, that the time given the railroad companies for acceptance will be extended. Negotiations between them and the city authorities are now under way, in which the main points under consideration are the question of land damages and the one already referred to of compensation for deepening the subways.

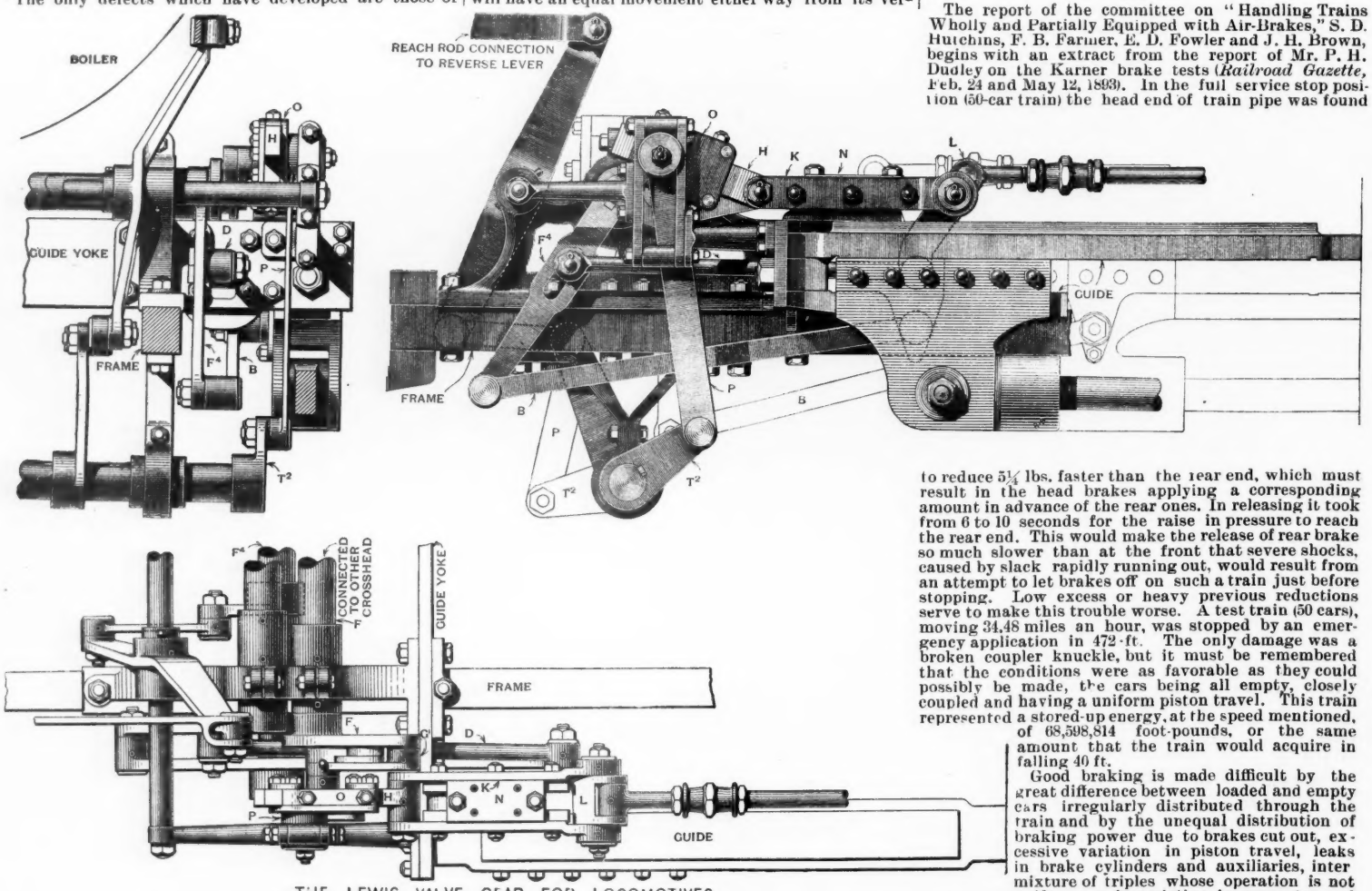
The amendments to the "trolley ordinances," upon which Mayor Hopkins insists, cover the following points: The use of iron or steel poles placed between the tracks whenever the width of street will permit; an independent return circuit; the space between poles to be not less than 115 ft.; poles for the conveyance of current from power house to lines, to be placed in alleys wherever practicable; no right to use any motive power but electricity, nor to lease the use of poles or wires to other

parties without the consent of the city council; the lighting of streets by the railroad company by arc lamps attached to the poles, and the payment of $250,000 as a contribution for the expense of track elevation and the deepening of the subways. He also insists that there shall be no trolley lines on Archer avenue east of the river, nor on Twenty-second street; that the rails used shall be subject to the approval of the city officials; that the paving of streets shall not be disturbed until a deposit has been made covering the estimated cost of restoration; that provision be made for indemnity to the city for damages sustained; that the franchises be limited to 10 years, and so drawn as to exclude transfer to any successors, lessees or assigns.

These proposed amendments are rather more stringent than street railroad companies are usually called upon to consider, but they seem business-like, and as the average net earnings of the Chicago City Railway Company during the past three years amount to nearly 22 per cent. upon a capitalization of $9,000,000, it can hardly be said that such conditions cannot be met.

The Lewis Locomotive Valve Gear.

Considerable interest has been manifested by railroad men in the performance of the Lewis valve gear, which has been in use on engine No. 39 of the Terre Haute & Indianapolis for nearly two years. This is an eight-wheel engine having 18 × 24 in. cylinders, 62 in. drivers, and weighing 45 tons. The engine was built by the Pittsburgh Locomotive Works and has been in use since Aug. 26, 1892, in both freight and passenger service. The only defects which have developed are those of minor mechanical details and these have been carefully avoided in later designs.



THE LEWIS VALVE GEAR FOR LOCOMOTIVES.

Our illustrations show the Lewis gear as designed for use on the class *F* engines of the Wabash to one of which it is to be applied. It will be seen that eccentrics are entirely dispensed with, and the valve driven instead from the crossheads each valve receiving motion both from its own crosshead and from the one opposite. In the side elevation which shows the mechanism of the right side, and a few of the parts on the left side in outline, the bar *B* drives from the crosshead the arm F^4 giving it a reciprocating motion and rotating back and forth the shaft to which it is attached and which reaches to the opposite side of the engine. Another shaft similarly driven from the left side of the engine and extending to this side carries the arm *F F*. The end of arm *F F* is attached to link G^1, and the other end of the link is connected to the bar *H* which slides in guide block *O*, and is attached at one end to *K*. *K* has a reciprocating motion and carries at its opposite end the floating lever *L*, to the upper end of which is connected the valve stem.

The reach rod is so connected as to control the motion of a shaft, reaching from one side to the other of the locomotive, from which project one on either side the two fixed arms T^2. The rods *P* connect the ends of these arms with the guide blocks. With the engine in full forward gear, as shown in the illustrations, the guide block on the right side will be in its highest position, its vertical range of motion being limited by the length of a guide in which moves a small block attached to the side of the bar *P*. The corresponding parts on the opposite side of the engine will be in their lowest position as indicated by the outlined bar *P* and arm T^2. With guide block *O* in the position shown, the motion of the arm *F* will cause the link G^1 to slide the bar *H* backward and forward in the block, thus moving *K* and the floating lever *L*, to which is attached the valve stem.

Lever *L* has also another motion derived from the bar *D*, one end of which is attached to the arm F^4 and the other to the lower end of lever *L*. The motion thus received from its own crosshead is used only to give the valve its lap and lead travel, amounting to twice the lap and lead. This motion can be so regulated as to give the proper lead by moving the end of the rod *D* in the slot in arm F^4. When once adjusted the motion thus derived is constant and entirely independent of the point of cut off. With the motion in mid-gear, the pin connection between the arm G^1 and the bar *H* will be on a level with the centre of the shaft to which the arm *F* is attached, and bar *H* will remain stationary, the valve then receiving only that motion due to its own crosshead. When in back gear the centre of the guide *O* will be below the centre of the shaft carrying arm *F*. The farther the position of guide block *O* from its central position, the longer will steam be carried before cut-off.

The length of rod *B* is so adjusted that the arm F^4 will have an equal movement either way from its vertical position. In order to equalize the admission of steam to each end of the cylinders at short cut-offs, the pin in the lower end of floating lever *L* is thrown out of line.

As the arms T^2 project on opposite sides of the shaft the weight of parts on one side balance those on the other. The reverse lever is consequently very easily handled even when under steam.

It is claimed for this valve gear that at full stroke the steam will follow the piston a greater distance and be released more freely than with the eccentric movement, and that at short cut-offs the point of release will be from 2½ to 3 in. later. Experiments on the Terre Haute & Indianopolis Railroad have shown that with the Lewis valve gear a larger nozzle can be used than with the ordinary link motion on engines otherwise alike and in similar service.

Mr. G. H. Prescott, Superintendent of Motive Power and Machinery on this road, in a letter dated Jan. 5 writes as follows: "We have now had this gear in constant freight and passenger service for 17 months, on an eight-wheel engine, 18 × 24 in. cylinders and 5 ft. wheel, and its work is very satisfactory. Its service so far has not developed any particular defects, nor does it show any wear of any consequence. The engine has not been favored or cared for more than usual, but runs with the others, freight or passenger, just as needed, and is really working into favor against a strong prejudice. In our opinion its principal points of advantage over the link motion are:

"Continuous lead, allowing as high as one-quarter inch at full stroke if desired, with no change when hooked up, making the engine strong on the start and free running at high speeds.

'The absence of all revolving parts like eccentrics, with a consequent reduction of friction and absence of wear, heating, etc.

"The ease with which the reverse lever can be handled when working hard at high speeds.

"The removal of eccentrics, allowing fireboxes to be made five and one-half inches longer with the same spread of drivers."

The motion of this gear is peculiar in giving a quick lead opening late in the stroke, thus making it possible to run with considerable lead at short cut-offs and high speed, without the jerky motion common to engines fitted with the usual valve gear, and also permitting the engine to run more freely at long cut-offs than would be possible with the ordinary gear and a much less amount of lead.

This gear is now being placed on several engines of various roads and will undoubtedly receive considerable investigation at the hands of railroad men. John A. Kellar, Licensee, Lewis Valve Gear Co., St. Louis, Mo., will give any further information concerning it that the reader may wish to get.

Handling Air-Braked Trains.*

The report of the committee on "Handling Trains Wholly and Partially Equipped with Air-Brakes," S. D. Hutchins, F. B. Farmer, E. D. Fowler and J. H. Brown, begins with an extract from the report of Mr. P. H. Dudley on the Karner brake tests (*Railroad Gazette*, Feb. 24 and May 12, 1893). In the full service stop position (50-car train) the head end of train pipe was found to reduce 5¼ lbs. faster than the rear end, which must result in the head brakes applying a corresponding amount in advance of the rear ones. In releasing it took from 6 to 10 seconds for the raise in pressure to reach the rear end. This would make the release of rear brake so much slower than at the front that severe shocks, caused by slack rapidly running out, would result from an attempt to let brakes off on such a train just before stopping. Low excess or heavy previous reductions serve to make this trouble worse. A test train (50 cars), moving 34.48 miles an hour, was stopped by an emergency application in 472 ft. The only damage was a broken coupler knuckle, but it must be remembered that the conditions were as favorable as they could possibly be made, the cars being all empty, closely coupled and having a uniform piston travel. This train represented a stored-up energy, at the speed mentioned, of 68,598,814 foot-pounds, or the same amount that the train would acquire in falling 40 ft.

Good braking is made difficult by the great difference between loaded and empty cars irregularly distributed through the train and by the unequal distribution of braking power due to brakes cut out, excessive variation in piston travel, leaks in brake cylinders and auxiliaries, intermixture of triples whose operation is not uniform, and variation in percentage of braking power to light weight of cars. Safety demands that we cut in all brakes and test them before starting; cut out only those in bad order and that cannot then be repaired, reporting same to the proper authority; that we carry maximum pressure, but use as little air in stopping as possible, remembering that empty cars or those with short piston travel when in a train with loads or cars with long travel, are especially liable to cause trouble if, at one time, a heavy though gradual application is made, and this more particularly if train is at a low speed. Tender and driver brakes should be kept cut in, and less air will have to be used to make stops, and they will assist in preventing shocks. . . . Blowing some air through brake hose at rear before coupling is not objectionable, as it serves to remove dirt. A heavy discharge from signal hose should be avoided, though, as it is detrimental to the diaphragm in the whistle valve. Inspectors or trainmen should have hose coupled, train pipe open (except at rear), and cars cut in before engine couples to train, so as to avoid delay and loss of air in charging. Train should be charged to at least 60 lbs. before testing, and sufficient time allowed for pressure in auxiliaries to equalize with that in the train pipe. As about one and one-half minutes suffices for this last, it will not, as a rule cause any delay more than that usually required to accumulate 60 lbs. in train pipe. In applying for the test 20 lbs. should be drawn off gradually, and valve handle then placed on lap, while inspectors or trainmen examine each car to see that brake applies, does not leak off and piston travel is right; after which brakes should be released and re-examined to see that all are off.

*A paper read at the meeting of Air-Brakemen's Association Columbus, O., April 13.

When between terminals a train has, for any reason, been uncoupled, after being joined again, and before starting, the engineer should reduce train pipe pressure until the trainman (back of where coupling has been made) seeing brakes respond, signals to release; if latter takes place no cocks in main pipe have been left closed. On leaving terminals, and when approaching points where damage might be done, if brakes could not be applied, a moderate reduction should be made which, if brakes are acting, will be quickly felt.

Freight trains partly braked and trains all braked are in many respects alike; with the part-air train, the shocks caused by rough handling are felt at the rear of the train instead of the head. Such a train is the most difficult to handle, and air-brakes must always be applied gradually or shocks are sure to result. Here especially train-pipe leaks increase the difficulties. The fact that they will assist in applying brakes must be taken into consideration. When applying brakes on an all-air train it cannot be said which way the slack will run, but with part air there is no doubt. When making a stop with the latter and going ahead, or in holding down grades, care should be exercised after bunching the train to keep it so until stop is made or foot of grade reached. This can be accomplished by keeping the brakes applied, or, if necessary to release, by the use of retaining valves on air cars or hand brakes directly back of latter, the former being preferable if on a grade. In stopping when backing up it is best to use hand brakes at rear of train, but before starting ahead they should be whistled off, and time allowed for trainmen to release them. Except in this case and in emergencies, hand brakes at rear of train should not be used in making stops, as by so doing the number of break in-twos are increased. Neither should they be used when holding down a grade, as when air is released the train might break in two, and, as has occurred, collide with serious results when air was again applied.

The idea that the hand brakes at rear should be used to keep train stretched on going over hog-backs or through sags is erroneous. The train should be managed from the engine by the use of steam, or the air-brakes, at the proper time. With the trainmen using hand brakes at rear end, and engineer steam at head end, they cannot always work in harmony. In passing a sag a light application of brakes just before the engine reaches it, or the using of steam as it passes beyond it, will prevent serious shocks. In passing over the summit of a short knoll, or of a "let-up" on a generally descending grade, steam should be used to stretch the train just before the summit is reached; or air applied as engine passes summit; or in some cases, the two methods can be combined to advantage.

In making stops with a train all air-braked, the brakes should always be applied gradually. It cannot be said which way the shock will run, but either way if it take place gradually no harm will result With loads ahead and empties at rear the train would stretch, and the same would result if all were loads, or all empties, and rear cars had much shorter piston travel than head ones. Reversing the conditions would also reverse results. In making stops at water tanks and coal chutes with long trains the safest plan is to cut engine off from train, though if care is used this is not absolutely necessary. Under no conditions should the brakes on a long freight train be released just before stopping.

The brakes on passenger trains should be released sufficiently before stopping to prevent that disagreeable recoil, due principally to the truck tilting in stopping and then righting itself again.

With passenger trains, in applying for stop the braking power should be early increased to near the amount necessary to complete the stop, instead of making a light application until near the stopping point and then a much heavier one. The heavier application acting over the longer distance exerts more retarding power with less expenditure of air, and is less likely to slide wheels.

The use of the conductor's valve, except in cases of emergency, should be discouraged. If necessary to use it, because of inability to get signal to engineer by usual methods, it should be opened gradually until noticed by engineer and then closed, permitting him to complete the stop.

Engineer should place valve in lap position immediately on feeling brakes apply from any unknown cause. In case train has broken in two or hose has burst the pressure will be maintained in main reservoir for releasing and recharging brakes as soon as this may be necessary. In case of a break-in-two, as soon as cock is closed on rear of head section, and signal given to back up, the handle of engineer's valve should be placed in either release or running position only long enough to release brakes, as it is not desirable to recharge auxiliaries on head-section then, for by so doing there would be greater liability that brakes would stick, and more loss of air when coupling was made.

The hand-brake should be kept free on all cars, as on some freight and on all passenger cars the effect of winding up slack on it will be to shorten the piston travel, which should be regulated at the proper amount by the dead levers.

If at any time a high main reservoir pressure is to be thrown back into the train pipe it should be done by gradually moving the handle of engineer's valve to release, unless the Westinghouse D 5 valve is used; in that the running position serves the desired purpose.

"Kicking off" is a bad practice which has of late assumed considerable prominence. It is applying and releasing many times in making a stop, without permitting auxiliary reservoirs to recharge. The object of this is to release part or all of the brakes; but there is no certainty as to how many or just what ones will release; the tendency is, though, for the head brakes to release first. Where part do release it tends to jerk the train, if a long one, and when reapplied results in the brakes that stayed on doing the most work and increasing their tendency to slide wheels. The manner of accomplishing this is to place the handle of the engineer's valve in release or running position only long enough to permit of a small raise in train-pipe pressure, and then returning it to lap preceding another application. The auxiliary reservoir pressure is always reduced, and without, as a rule, a corresponding reduction in speed of train.

The ease with which by this method brakes can be released, and without a sudden reduction quickly applied again, together with non-application of its dangerous feature, has led to an indiscriminate use of it by engineers, which, it is believed, has been responsible for many so-called brake failures, some of which have resulted seriously. In a beginner this might be excusable, but its indiscriminate practice is indicative of carelessness or poor judgment on the part of the engineer. The practice is not always wrong. It is useful when a train standing with brakes applied must be moved a short distance, especially if on a grade and the move is down hill. In such cases its usefulness is unquestioned, and it is free from danger. With short trains at low speeds, if stop is being made too soon, it can also be employed: but if train is long it had best not be used while running, as a break-in-two may result. In switching it is almost indispensable, but we would urge the necessity of having its improper use stopped, as a total prohibition would be better than its wrong continuance.

Some roads prohibit the use of air-brakes on cars when switching, but such instructions are not in the interest of good service, for with air-brakes in operation and handled properly, it is possible to do the work quicker and with much greater safety. But the engineer should think more and not merely act as a machine when the button is pressed by the trainman. Trainmen, too, should give signals that, by conveying the idea of distance, will permit of an exercise of judgment on the part of the engineer. He should not wait until the last car is over the switch and the stop signal given before commencing to apply, nor when cars have been given a "kick" should he interpret the stop signal as a call for emergency position. If unable to see and he cannot get a distance signal he should take the safe side and proceed slowly.

Reversing with driver brakes cut in should not be practiced, as flat tires will result. More driving wheel tires are flattened by leaky driver brakes than by good ones, for with the former when a service application is being made the comparatively small amount of air admitted to the cylinders at each reduction will, in the interval that elapses between reductions, leak away so that at no time is there any considerable amount of pressure in them, and the engineer is led to believe that these brakes will not hold at all. Consequently, in a case of emergency, he reverses the engine after applying the brakes, and the drivers are slid because the entire volume of the auxiliary is suddenly connected with the brake cylinder by a large port and for this reason at once raises and maintains cylinder pressure at a high amount for a sufficient time to cause the result mentioned.

Sand.—The use of sand increases the stopping power of brakes considerably, and should always be used in case of emergency. Its correct application in a service stop when the rail is slipping is also of benefit. The proper method is to commence its use before brakes are applied at all hard, and continue up to stop. Commencing to use it when near stop to prevent going by is very liable to result in bad flat spots in wheels which have commenced to slide before sand was used.

Mountain Service.—Where two or more engines are coupled to train, the head engine should handle the brakes, and engineer's valves on all other engines should be kept cut out unless called on to help recharge train, when they will cut in only long enough for that purpose. The air pump must not be stopped on any of the engines, for each must be ready to take charge of brakes in case of failure of leading engine. Where a helping engine is coupled to rear of train steam should be worked up to stopping in ascending grades, and in starting the pusher should not respond to the go-ahead whistle signal of leading engine, until after having released brakes (if cut in) and started as much of train as possible. At all other times rear engine should keep engineer's valve cut out. Where two or more engines are on head end the brakes should not be released until the other engines have answered the go-ahead whistle of head engine, and head engine must then be allowed to alone start as much of the train as possible, when second engine will then assist, and if there is a third, steam should not be used on it until leading engines have exerted full power or started train. The object is to avoid jerking train. Where train in descending a grade has been standing with brakes applied for sufficient time for pressure to reduce considerably, time for recharging can be had by backing engine or engines solidly against train at time of releasing and hold train with steam until recharged. In stopping for coal or water on a heavy ascending grade the rear engine should be stopped for this purpose first, and then drop the train back for other or others; and the reverse when going down grade. Retaining valves should invariably be used on heavy grades and on all cars, as the use of them on only a part increases the holding power of cars with retainers over that of others, causing hot wheels and sometimes broken ones. Where wheels on any certain car are much hotter than on others, by turning retaining valve down they may be allowed to cool off; and when a stop is made the slack should be let out so that the piston can travel farther.

To hold trains after stopping, the following rules should be adhered to; they will apply also to level track:

1. Do not depend on air-brakes holding train when crew is away from engine, or when engine is cut off from train.

2. Always release air before applying hand brakes.

The reason for the first rule is that the air may gradually leak off. For the second that on most freight cars the hand brake works in unison with the air, and if set at same time, when air is off, hand brake will be applied so hard that one man alone cannot release it without a lever. On passenger cars and on some freight, the air and hand brakes operate against each other, so that though an attempt should be made to set the latter when air was applied, when the air was released the hand-brake would also go off. Do not attempt to use hand-brakes in place of retaining valves.

In backing passenger trains in yards where trains are controlled by man on rear car by means of angle cock or "back-up hose," the train line should first be charged to maximum pressure, and when starting to back up handle of B valve should be placed in running position. This gives the man on the rear absolute control, and, in case brakes are felt to apply, the engineer should temporarily place valve handle on lap.

Emergency.—In case of actual danger it is best to throw the valve handle to the emergency position as soon as possible, regardless of what position it was in previously, holding it there until stop is made or danger is over, using sand also. Although a quick reduction of only a few pounds is necessary to cause quick action, it should be remembered that there are many plain triples yet in use, and also that owing to lack of inspection and repairs quick action brakes are often cut out. Should several of the cars with plain triples, or with quick actions cut out, be together in the train, the quick action could not go behind these when emergency application was used; and if the handle of engineer's valve was returned to lap after a sudden but short reduction, there might follow, in addition to failure to get quick action on the entire train, a release of some of the head brakes. By leaving handle in emergency position there is more probability of getting quick action throughout the train. A form of equalizing discharge valve should be used, having a positive service stop when quick action cannot be got.

Plate D.—The Westinghouse Plate D 5 engineer's valve may be considered as acting the same as the Plate D 8, except in running position. In this position the structural difference is the enlarging of the port to train line, and in place of an excess pressure valve a feed valve is used, the duty of which is to shut off the feed into train pipe when the maximum pressure is reached.

The governor being connected to main reservoir (D 5 and set at about 90 lbs. (depending on amount of excess desired), it will be seen that handle of valve must not be carried in full release, else that amount of pressure will be obtained in the train pipe. Should this be done and auxiliaries charged above 70 lbs., the result of bringing the handle back to running position would be, if train was leaky, that brakes would creep on until the train pipe had been reduced below 70 lbs. To avoid this trouble it is only necessary to see that the handle is never left in full release long enough to charge train pipe to 70 lbs. Except where trains are exceedingly long or very leaky, brakes can be readily released by merely placing the handle in running position. . . .

Excess pressure in the main reservoir above that in train pipe is to facilitate prompt release. It is generally recommended that a constant excess of from 15 to 20 lbs. should be carried, but it is only with the last brake valve introduced (Plate D 5) that such an excess can be well maintained. When considering what a given amount of excess pressure will accomplish, the all-important factor of volume is often overlooked. . . .

Engines should be equipped with as large main reservoirs as possible, and engineers should see that no water is allowed to accumulate therein. Also that the amount of excess carried be as low as consistent with the work to be done, thereby making easier the labor of the pump.

Recapitulation.—Carry maximum train-pipe pressure if possible; no more, no less. Apply so as to run in or out carefully, and after bunching or stretching train endeavor to keep it so while holding. Avoid emergency except in case of danger. Cut in all cars in good order and report all those not so. Do not practice using full braking power (20 lbs. reduction) for service stops. Always endeavor to have a reserve. Do not fail to test brakes before starting, after switching, and at all dangerous places. Do not expect too much from a few air cars in a long train. Release on passenger trains before stopping, but not on freight. Run the pump as slowly as possible.

Maintenance of Freight and Passenger Brakes.*

The freight brake [air] was first generally applied by the Western mountain roads, where the heavy grades made necessary a continuous brake to safely handle their trains. The provisions made for testing and maintaining these brakes have grown gradually, and we can profitably look to the mountain roads for advice in maintaining air-brakes on freight cars.

In making estimates of the cost of maintaining air-brakes on freight cars, it would be unreasonable to base them on the present condition of brakes, for that is no criterion. Considerable money will be required to *reclaim* the majority of air brakes on the level road lines from the various stages of irresponsibility and practical disuse into which they have been allowed to drift, from neglect and insufficient care, and after that is done the cost of maintaining will be much less. The present poor condition of air-brakes on a great many of our freight cars is not wondered at when we consider the neglect with which they have been treated. The care of them has been given to men whose duties consist of tapping wheels, oiling boxes, and other work incidental to getting a freight train in condition to be pulled out of the yard. Their knowledge of the apparatus and ability to attend to a deranged brake is to tap it with a hammer and then cut it out.

The maintenance of air-brakes on freight cars has not been secured when a few of the roads begin to care for them, and others do not, for then the maintenance would cease when a car leaves its own line, but the object sought for will only be had when some plan is universally adopted whereby an air-brake may have attention when it is away from home the same as when it is on its own line. It will be necessary for railroads to do two things, viz.: adopt some protective system whereby brakes coming on their own line from other roads shall be in first-class condition before the car be accepted, and establish a defect-card system whereby disorders, arising en route, may be reported and corrected upon reaching the terminal, with as little loss of time as possible.

Testing plants should be put in at proper points along the line; and in installing these plants care should be taken to lay pipe to tracks within reach of trains en route, lading tracks catching every car, both through and local, and not to repair tracks alone. Sufficient air should be had to test the brakes with the standard pressure carried in service.

The experiment of using a switch engine for testing purposes has proved a failure and does not give satisfaction, for it is generally the case that the yard crew is using the engine when it is wanted for testing a train, and they are necessarily idle while the inspector is using it. Air for testing plant may be furnished by regular air pumps placed in the plant, or may be furnished by pumps placed on the rack by the machinist who, after repairing them, desires them to run for a few days before placing them on the engine, thus insuring perfect performance after going in regular road service.

To the report of the Committee are appended details of maintenance for passenger and freight brakes, drawn from the practice of the members of the committee themselves. They recommend the appointment of a practical general inspector; the provision of drawings of all the brake gear, which should be put in the hands of car foremen; the provision of spare parts; the sending of more delicate parts to one common center for repair by a competent mechanic, and the use of a defect card, which will not only help repair men, but will obviate the handling of cars with brakes cut out which are actually in good order. Records of cars arriving at terminals with brakes cut out show that fully 90 per cent. will work all right after being cut in. In a majority of cases they are cut out between terminal points, usually in switching.

The Committee recommends a yard testing plant, proper connections every two car lengths and hose sufficiently long to reach to every track. An important point made is that a strainer should be so placed as to prevent scale from yard pipes getting into the train pipes. The Committee specifies that in testing application should be made with 6 or 8 lbs. reduction, and each

* Extracts from a paper read before the Air-Brake Men's Association at Columbus, O., April 13, by F. M. Nellis.

car examined to see not only that the brakes are set, but that they remain set a reasonable time. In this particular the M. C. B. rules are not exacting enough, as they do not guarantee that the brakes will not leak off sooner than they should. The matter of uniform piston travel should be carefully watched, as this is very important.

The Canda Platform Car.

The engraving shows a 41 ft. flat car built by the Ensign Manufacturing Company, of Huntington, W. Va., for the transportation of timber and piles. The dimensions of the car and the sizes of the parts are all given in the illustrations. The special feature of the car is the

Canda Flat Car.

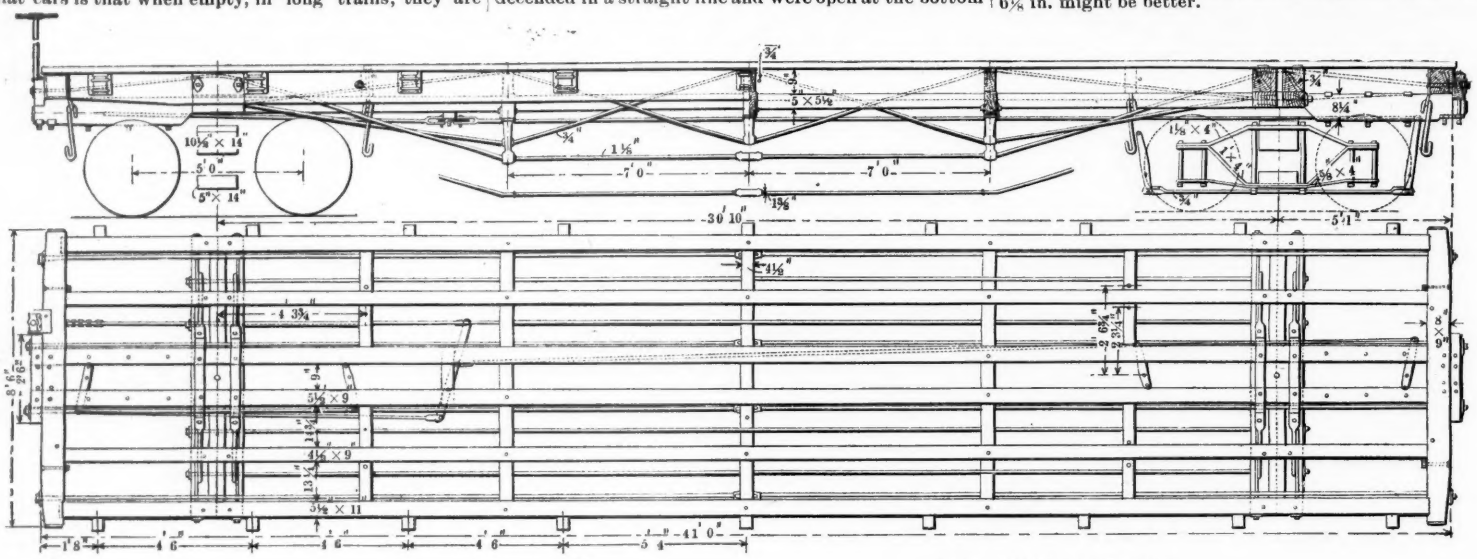
underframing, which consists of unusually deep sills, 5½ × 11 in., and 5½ × 9 in., and the trussing which prevents buckling up or down. One serious difficulty with long flat cars is that when empty, in long trains, they are likely to buckle up, disengaging the truss rods if not rupturing the sills. This car is trussed in a way to withstand such strains. It is equipped with the Canda drawbar attachment, and malleable iron castings are used throughout. The truss rods are provided with forged collars to prevent the struts from moving on them. The cars are frequently loaded to more than their carrying capacity of 60,000 lbs., but they have stood up well under the loads imposed, and kept their camber. They are chiefly engaged in carrying car sills, bridge timber and piles from Georgia to the Northern markets

Shaft Sinking by Freezing.

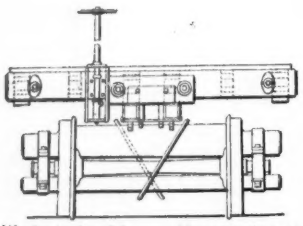
A method of sinking shafts through water-bearing strata, devised by M. Gobert, was described in a paper recently presented by him before the Société de l' Industrie Minérale. It is in some respects similar to the Poetsch-Sooysmitte method. In the Poetsch method, the soft material to be excavated is frozen by driving into it tubes through which a freezing liquid is circulated, the liquid being kept at the necessary low temperature by being passed through cooling coils on the surface. A difficulty with this method of freezing, however, resulted from the fact that the freezing liquid in the tubes is at a pressure above that of the atmosphere and there is thus, a tendency for it to leak out at every weak point in the tube system. When the liquid escaped and entered the adjoining material it prevented the latter fron congealing.

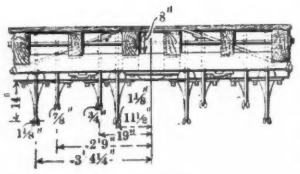
M. Gobert's efforts were directed to securing a system in which the pressure within the freezing tubes would be lower than that outside, and he adopted anhydrous ammonia as the fluid to be used directly in the tubes instead of the secondary freezing liquid used by Poetsch. The ammonia gas is compressed until it assumes the liquid state, as in the regular ammonia compression refrigerating machines, and is then injected into the freezing tube system where it evaporates and abstracts heat from the surrounding material. The ammonia gas is at a relatively low pressure, always lower than the outside pressure.

In order to increase the rapidity of the freezing process, M. Gobert uses forced circulation in his tube system, first injecting the liquid ammonia, which quickly evaporates, then drawing it through the pipes, and finally again compressing it into a liquid ready to be used over again. This series of operations is repeated continuously. When the liquid ammonia is injected into the freezing tubes its tendency is, of course, to drop at once to the bottom and collect there, and, this being the case, its evaporation would be comparatively slow and the freezing process correspondingly inefficient. This would be so particularly if the freezing tubes decended in a straight line and were open at the bottom



THE CANDA FLAT CAR.





issuing into a larger surrounding tube as in the Poetsch system. To overcome this, Mr. Gobert makes the inner tube in the form of a worm, closes it at its lower end, and punctures it along its whole length with a number of small holes through which the liquid ammonia escapes in small quantities and is rapidly vaporized. By suitably arranging these small escape orifices, the freezing action may, if desired, be concentrated at any depth in the tubes instead of being uniformly distributed.

A full description, and illustrations of some of the more important details of the system are given in the *Revue Industrielle* of February 24.

The Relation of Wheels to Frog Points and to Guard Rails.*

Two sets of maximum and minimum wheel gages (back to back of wheels) have in past years been adopted by the Master Car Builders' Association (see fig. 1). The first set, in 1885 (see figs. 2 to 5), gave for *A B*, fig. 1, 4 ft. 5⅛ in. as the maximum, and 4 ft. 5¼ in. as the minimum, allowed. In 1887 a larger maximum, 4 ft. 5¾ in., and a smaller minimum, 4 ft. 5 in., were adopted, and have since been maintained, giving the large allowed variation of ¾ in.† This action appears to have been taken without concurrent action by any other large body of officials or engineers in charge of track. It leaves many thousand cars in this country running over frogs and track unsuited to this later or 1887 set of wheel gages. . . .

The track gage point as taken on the wheel is found to lie on a curved surface, without any distinctive feature to identify it. The curves in the flange and tread of the wheel and in the top of the rail head prevent the ascertaining by calculation any definite point of contact from which to calculate further. The wear of wheel and rail add to the uncertainties of computations. The only method even approximately clear of great possibilities of confusion is to place a full-size drawing of the wheel tread on a full size drawing of the rail, and ascertain results by following as closely as possible what occurs in actual operating.

The first difficulty met in an examination of this sort is to know just what the gage of a track is. It seems strange that after so many years of railway experience this should not have been officially defined by any large body of officials. Many consider the gage as between the upper corners, *E G*, of rail heads. On one or two roads, and in at least one large manufacturing establishment for frogs and switches, the gage is taken at mid-height of the rail head. On very few standard drawings is this point definitely determined. In this examination, the gage of 4 ft. 8½ in. has been taken as between the points *C D*, figs. 2 to 5. The flangeways, on the other hand, are often found to be measured with a foot-rule, and between the points *E F* and *G H*. The proper plan is to measure with a guard rail gage direct from the side of the frog point to the working side of the guard rail. These are the two points directly concerned in the guard rail arrangements. . . .

The distance from the side of the frog point to the working side of the guard rail also seems to be indefinite on many standard plans of railway companies. One of the most important roads in this country issues a standard plan with no widths of flangeways stated. The distance from wing rail to guard rail is given at 4 ft. 5 in. between working sides, but it is not stated whether this is at top or bottom of the rail head. Some of the frogs of that company have a flangeway of 2 in., leaving 1½ in. for guard-rail flangeway, with track gage 4 ft. 8½ in.

All the examinations, figs. 2 to 5, are with the 1885 or least objectionable set of wheel gages. It was considered that whatever was found objectionable for this system would, of course, be more objectionable for the 1887 system, and that it was necessary to test the latter only upon an arrangement satisfactory for the 1885 gages, namely upon fig. 5.

Figs. 2 to 5 are all for a gage of 4 ft. 8½ in. with unworn flanges. A worn flange lies farther away from the frog point, and does not require consideration in this connection as regards spacing. Various locations of the guard rail with reference to the frog point have been taken, and the interference of a maximum gage with the frog point is shown in these figures. Any guard rail distance *K C* less than 4 ft. 6⅛ in., or guard rail flangeway *K D* greater than 1⅝ in., with track gage as noted, will give an interference at the frog point. A distance somewhat greater than 4 ft. 6⅛ in. might be better.

Placing the 1887 wheel gages on such an arrangement as that shown in fig. 5, we see in fig. 6 that the 1887 maximum wheel gage gives a large interference at the frog point; and the 1887 minimum wheel gage gives some interference with the ring rail. Fig. 7 shows the first movement that probably takes place with the large maximum, running toward the frog point, with the arrangement the same as in fig. 5. The wheel momentarily rides on its flange and rises, the tread having no bearing. This gives a heavy blow and lateral pressure on the frog point. The second movement is probably that shown in fig. 8, a shifting of the wheels with a heavy lurch, the guard rail becoming inoperative.

Fig. 10 shows how large the lateral movement becomes as the guard rail is approached, with the 1887 minimum and a worn flange. For this reason the gage should not be widened more than is necessary in any case. It also gives an additional reason for a return to the 1885 gages, and for the use of a long taper to the guard rail.

To accommodate the 1887 gages while they remain in force, both the distance from the frog point to the guard rail, and the width of flangeway in the frog, require enlargement. Fig. 9 shows an arrangement that may be fairly satisfactory to those who do not demand a narrow flangeway in the frog. The pressure from roads of 4 ft. 8½ in. gage has of late been so great to reduce flangeways in frogs to 1¾ in. that the arrangement in fig. 9 will not be generally acceptable. There is no alternative but a return to the 1885 wheel gages.

Although these broad flangeways of 2 in. are used in many parts of this country (chiefly on roads of 4 ft. 9 in. or compromise gage) most of the roads using such a flangeway would probable prefer to reduce it to 1¾ in. . . .

Engineers, roadmasters and frog-builders do not seem to be of one mind as to why frog flangeways should be reduced to 1¾ in. or less. Some of the reasons, as noted in operating or claimed to exist, are as follows:

1, and perhaps most important: The rules of the Master Car Builders' Association allow a loss of ¾ in. from rim of tread. This portion constitutes the chief part of the wheel that is to carry the wheel past the throat of the frog, as at *H M*, fig. 12. See also fig. 16. The master car builders appear to have overlooked the value of the outer rim when at the frog point. This reduction, combined with the breakage of a little more when the wheel is at the throat of the frog, lets the wheel down into the throat, causing derailment. Hence the narrower the throat is, the better; and a return to the 1885 wheel gages is called for. In this connection it would be well to give attention to the filler bearing, which is the secondary bearing in cases of chipped rims.

2. With the broad flangeway, the coning of the outer part of the tread allows the wheel to drop deeper into the throat of the frog. This causes a blow in running facing point, or a sudden drop to the wing rail bearing, in running trail. See fig. 16.

3. The wear on wing rails is claimed to be greater with the broad flangeway. At first sight this would appear to be the case. An increase of ¼ in. in each flangeway, giving ⅛ in. less bearing of tread on the wing rail, would

* Abstract of a paper by Archibald A. Schenck, M. Am. Soc. C. E., read April 18.

† One of the Rules of Interchange.—EDITOR.

appear to increase the wear and destruction of the wing rail. In reality there is no gain of increased bearing on the wing rail. There is a slight gain in the following respect, namely, that the point where the tread leaves the wing rail is shifted farther from the frog point, in a narrow flangeway. With a 2-in. flangeway, the tread leaves the wing rail at *G*, fig. 12. With 1¾-in. flangeway, this point is shifted to *A*, or, in a No. 10 frog, about 5 in., giving a little wider bearing on the frog point, although the increase is not great, nor as much needed as in the case of a rim bearing. So far as an increase of rim bearing is concerned, it will be noted that the outer part of the tread is crossing the wing rail at an angle. Whatever the flangeway width, there must be a triangular area, *S A C* or *T G I*, where the width of bearing is gradually lessening. With either of the flangeway widths named this point *A* or *G* is far enough from the frog point for the point to furnish a considerable width of bearing. It is therefore doubtful whether narrowness of tread bearing is a large factor in frog wear. This is still more evident if we consider the effects of false flanges, which are the agency most destructive in frogs. Fig. 12 is intended to illustrate such wear from false flanges. This wear will be found most largely in yards, where the treads of shifting engines are for some reason allowed to have very deep hollows, although running over frogs constantly. The maximum hollow of tire allowed is assumed to be about ⅝ in. in shifting engines, and about $\frac{3}{16}$ in. in wheels in general service. The false flange simply crosses the wing rail from one side to the other, as indicated by the shaded strips *A B C D* or *G H I J* in Fig. 12. In many frogs in

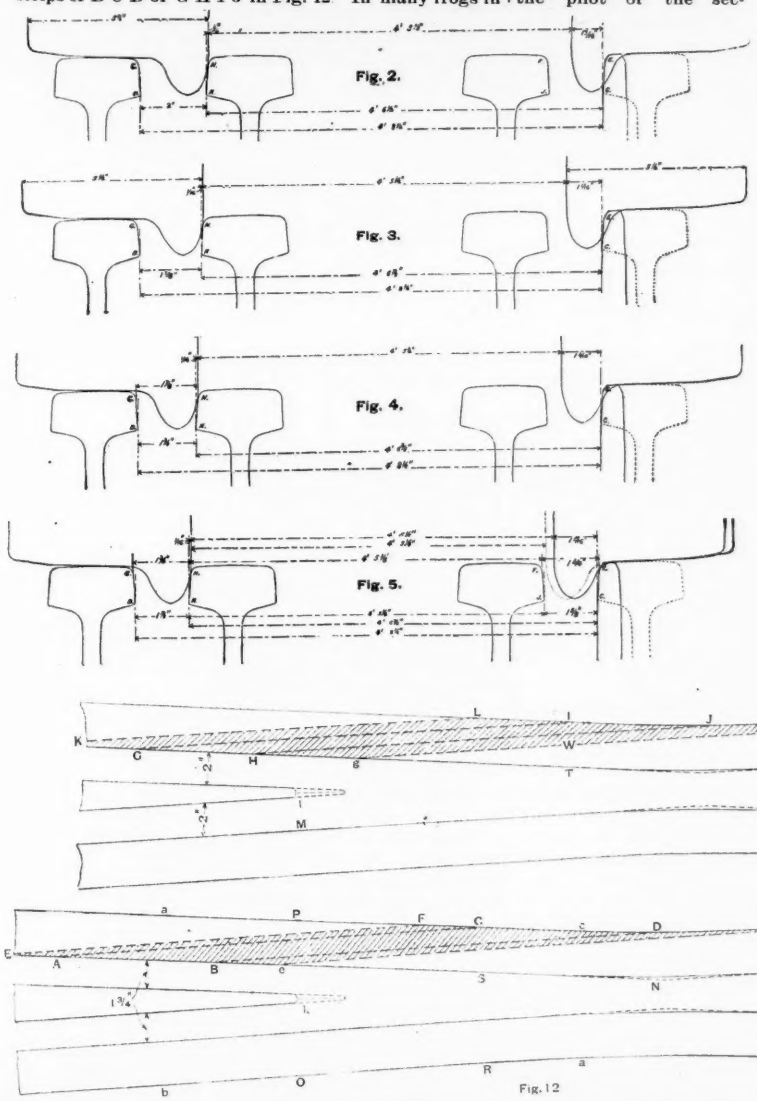
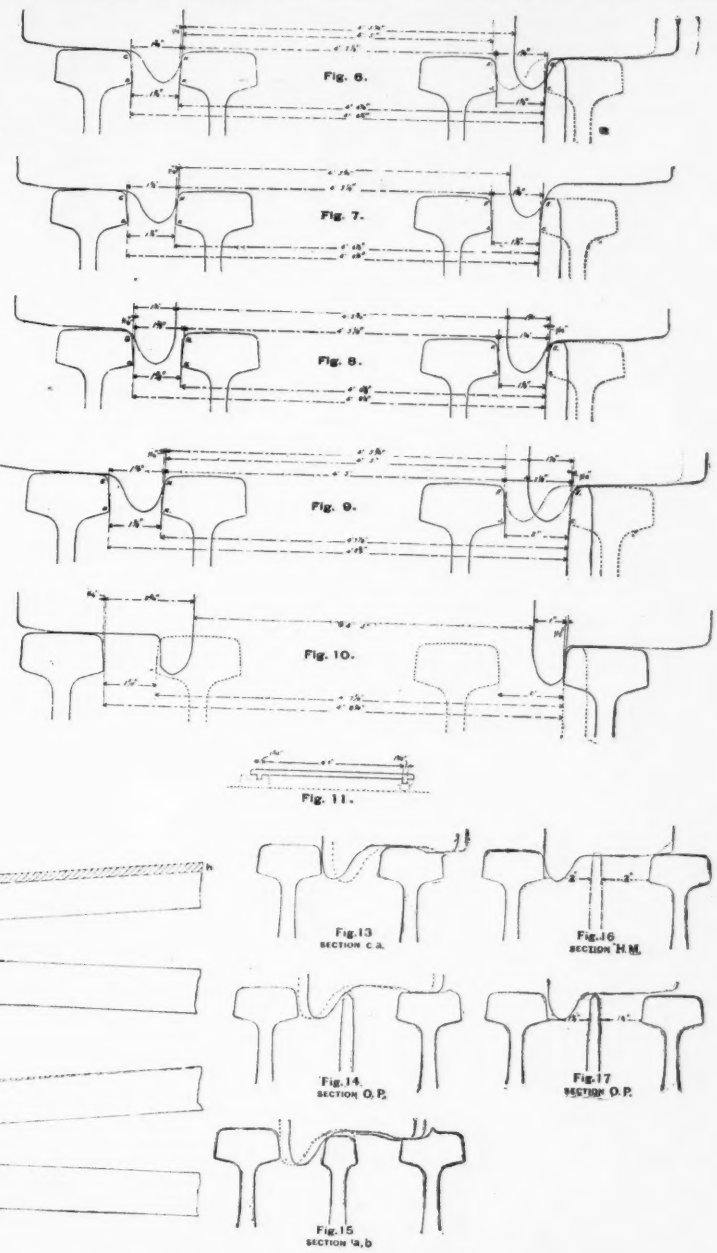


Fig. 12.



service this line will be found either somewhat grooved, if the frog be old, or merely polished, if the frog be new, while the area *D B M* or *W H T* is often dull or sometimes almost rusty. The strips *A B C D* or *G H I J* become channeled out soon. These channels or grooves are much deeper at each end than in the central portion of their length. A lip is formed on the rail outside, and would be formed also where the wheel leaves the wing rail inside but for the wear of flanges against it. A lip is also formed on top of the rail, outside of the line of false flange bearing. When the areas *D B M* or *W H T* become much higher than the channels cut by the false flanges, these areas are worn down rapidly by new wheels, and in general do not long remain much higher than the false flange grooves. This wear from false flanges is so great in many situations as to be the only one worthy of consideration, and in such cases flangeway widths are not of importance, so far as wear is concerned. Figs. 13, 14 and 15 show in section approximately some of the effects of false flanges.

In examining to what extent the narrow flangeway is more desirable than the broad flangeway, many other considerations than mere width of tread bearing should be kept in mind. One consideration is that simultaneous bearing on both frog point and wing rail are seldom secured. Usually either the point alone or the wing rail alone carries all the weight. When both point and tread are new, the bevel on the outer edge of the tread throws all the bearing on the frog point (see fig. 17). A wing rail badly worn by false flanges, or a yielding wing rail, has the same effect. A wing rail bent vertically, part of it low, part "cocked up," also throws all the bearing on the frog point in some cases. In all such cases, the width of flangeway is not of importance. On the other hand, many frog points will be found to "duck" as the wheel approaches them, leaving the wing rail to carry all the weight. The lack of base which the rail forming the frog point has at the point, tends to allow this "ducking." In this case, the width of tread bearing is important, to carry the wheel firmly until the depressed portion of the frog point has been passed. Hollow tires also prevent simultaneous bearing. These failures to secure simultaneous bearing make it desirable to ignore the frog point as a bearing for some distance from the point, and to make narrow flangeways and a return to the 1885 wheel gages desirable. But so far as wear from broad flangeways is considered, this effect can readily be made too much of.

Train Accidents in the United States in March.

COLLISIONS.

REAR.

1st, on New York Central & Hudson River, near Tarrytown, N. Y., an express train (carrying no passengers) drawn by two engines, broke in two between the first and second engine; the foremost engine at once dashed ahead faster than the rest of the train, but the automatic action of the air brakes seems to have been more effective on this engine than on the rear part of the train, and the latter ran into the forward engine, breaking the pilot of the second engine and derailing it. This engine and 2 cars fell into the Hudson River, and the next 4 cars were overturned. The engineer and fireman jumped out upon the ice and the former was injured. An express messenger was injured by falling boxes.

4th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Winimac, Ind., a freight train ran into the rear of a preceding freight and the engine was overturned. The engineman was fatally injured. It is said that he was asleep when he approached the other train.

20th, on New York, Chicago & St. Louis, near Fort Wayne, Ind., a freight train broke in two and the rear portion, subsequently ran into the forward one, wrecking several cars. Two men riding in one of the cars were killed.

25th, on Great Northern, near Summit, Wash., a rotary snow plow with two engines attached, became uncontrollable on a descending grade and ran into the rear of a passenger train, wrecking the dining car and badly damaging several sleeping cars. Six passengers were slightly injured.

And 15 others on 14 roads, involving 3 passenger and 17 freight and other trains.

BUTTING.

1st, on Iowa Central, near Rapatee, Ill., butting collision of freight trains, wrecking 3 engines and several cars. A fireman was injured by jumping. It is said that a telegraph operator failed to deliver an order.

24th, on Norfolk & Western, near Williamson, W. Va., butting collision of freight trains, wrecking both engines. It is said that there had been a mistake in telegraphic orders. Soon after this collision the northbound train was run into at the rear by a following freight train, and tramp was badly injured.

28th, on Illinois Central, near Oxford, Miss., butting collision of frieght trains, injuring several trainmen.

And 5 others on 5 roads, involving 1 passenger train and 9 freight trains.

CROSSING AND MISCELLANEOUS.

1st, on Northern Central, near York, Pa., a passenger train ran over a misplaced switch and into a freight train. Several employees were injured.

2d, on New York, Lake Erie & Western, at Jersey City, N. J., a passenger train of the New Jersey & New York Railroad ran into an empty train that wasswitching across the main track, doing considerable damage. One passenger was injured.

26th, on Pittsburgh & Western, at Monroe Falls, O., collision between a freight train and a work train, wrecking one engine and 10 cars. A brakeman was killed.

26th, at Niles, O., a car in a passenger train of the New York, Pennsylvania & Ohio was run into by a freight train of the Pittsburgh & Western at the crossing of the two roads. One passenger was injured.

31st, 1 a. m., on New York Central & Hudson River, at Amsterdam, N. Y., a freight train switching across the main passenger track was run into by a westbound express train. The engine fell down a bank and 3 freight cars were badly damaged. The engineman was slightly injured. It is said that the flagmen of the freight, on hearing the whistle of the approaching passenger train, thought it was a train on the West Shore Railroad, and therefore failed to give the stop signal in season.

And 8 others on 6 roads, involving 4 passenger and 9 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

1st, 6 a. m., on Mississippi River & Bonne Terre, nea Herculaneum, Mo., a freight train consisting of an engine and 13 cars broke through a trestle bridge ove Joachin Creek. The whole train fell into the mud and water below. The engineman was killed and 3 other trainmen were injured.

18th, on Union Pacific, near Oconee, Neb., a pay car train was derailed and ditched by a broken rail and the car took fire. The Division Superintendent and the Road Master were injured.

And 3 others on 3 roads, involving 3 passenger trains.

DEFECTS OF EQUIPMENT.

29th, on New York Central & Hudson River, near Penfield, N. Y., 3 cars of an eastbound freight train were derailed by the sudden application of the air brakes in the front portion of the train in consequence of the engine breaking away from the train.

30th, on Pennsylvania road, near Tomhicken, Pa., a car in a freight train ascending a grade was derailed by a broken axle; there was a pushing engine at the rear, which could not be readily signaled to stop, and 17 cars were badly wrecked.

And 13 others on 10 roads, involving 2 passenger and 11 freight and other trains.

NEGLIGENCE IN OPERATING.

19th, on Maine Central, near Newport, Me., the engine of a work train was derailed by running over a hand car, and the engineman was killed.

22d, on Newport & Sherman's Valley road, at Sylvan, Pa., a passenger train was derailed at a misplaced switch, and the fireman was killed.

28th, on Pennsylvania road, at Broad street, Philadelphia, a car of a passenger train being pushed into the head house became uncontrollable, and one end was crushed against the buffer block, doing considerable damage. One passenger was injured.

And 2 others on 2 roads, involving 2 freight trains.

UNFORESEEN OBSTRUCTIONS.

6th, 1 a. m., on Atchison, Topeka & Santa Fe, near Paul's Valley, I. T., the engine and four cars of a freight train were derailed by a pile of sleepers which had been maliciously placed upon the track, and fell down a high bank. Three trainmen were injured.

7th, 3 a. m., on Pittsburgh, Fort Wayne & Chicago, at Kenwood, Pa., a freight train was knocked off the track by a landslide and the engine and 5 cars were swept into the Beaver River. Three trainmen were injured.

8th, on Norfolk & Western, at Solitude, Va. a passenger train was derailed by a landslide and the engine fell down a high bank. The engineer was killed and the fireman injured.

10th, 4 p. m., on Maine Central, near Ellsworth, Me., a work train running backward ran over a wagon at a crossing and nine employees were injured.

10th, on Chicago, Rock Island & Pacific, near Limon, Col., a freight train was derailed by a sand drift, the engine being overturned and several cars badly wrecked. Five trainmen were injured, two fatally.

12th, 3 a. m., on Central Vermont, near Montpelier, Vt., a passenger train was derailed by a mass of rock which had fallen upon the track in a cut, and the engine and first three cars were wrecked. The engineer was killed and the fireman and one mail clerk injured.

13th, on Union Pacific, near Piedmont, Wyo., a work train was derailed by a rock which had fallen upon the track, and the engine and two cars were wrecked. Three trainmen were injured.

13th, on Union Pacific, near Durkee, Or., a freight train was derailed by running over a cow and the engine was overturned; fireman and one brakeman killed and engineer injured.

13th, on Union Pacific, near Revere, Idaho, a passenger train was derailed by a landslide and the engine and first three cars were badly wrecked. The engineer and three tramps were killed, and the fireman and two mail agents were injured.

14th, on New York, Lake Erie & Western, near Stockport, N. Y., an eastbound freight train was derailed by a large rock which had fallen upon the track, and several cars fell down a bank. A track watchman discovered the obstruction at once, but while he was flagging a train from the East the one from the West ran into the rock.

15th, on Pittsburgh & Western, near Sample's, Pa., a freight train drawn by 2 engines was derailed by a landslide, and the engines were overturned. Both engineers were injured.

19th, 1 a. m., on Texas & Pacific, at Santo, Tex., a freight train was derailed by running over a horse. The engine was overturned and 7 cars were wrecked. A brakeman was killed and the fireman was injured.

And 5 others on 5 roads, involving 2 passenger and 3 freight and other trains.

UNEXPLAINED.

6th, on Pittsburgh, Cincinnati, Chicago & St Louis, in Columbus, O., a car in a passenger train was derailed at a switch and fell against a signal tower. Six employees in this building were injured. It is said that the switch was turned under the train.

6th, on Southern Pacific, near Alleyton, Tex., a passenger train was derailed and wrecked. Two trainmen, 2 passengers and two tramps were injured.

6th, on Southern Pacific, near Houston, Tex., a freight train was derailed and 6 trainmen and 2 tramps injured.

8th, 1 a. m., on Union Pacific, near Webster, Col., a freight train was derailed and several cars fell down a bank. A tramp was injured.

9th, on Western New York & Pennsylvania, near Oil City, Pa., a freight train was derailed and several cars fell into a river. The wreck took fire from oil in the train and burned so rapidly that the trainmen were obliged to swim across the river to save themselves. Fireman Martin was either drowned or burned to death. The burning oil spread out on the surface of the river.

13th, on Chicago, Milwaukee & St. Paul, at Westcott, Minn., an emigrant train was derailed and 5 cars and a caboose fell down a bank. The conductor and 1 passenger were injured.

23d, on Missouri, Kansas & Texas, near Lockhart, Tex., a passenger train was derailed and 3 cars fell down a high bank. Five passengers were injured.

31st, on Buffalo, Rochester & Pittsburgh, at Bradford, Pa., a car in a switching freight train on a side track became uncontrollable and was derailed and fell off a trestle onto an iron bridge supporting the main track. The bridge was so badly damaged that it had to be taken down.

And 18 others on 15 roads, involving 7 passenger and 11 freight and other trains.

OTHER ACCIDENTS.

2d, on Pennsylvania road near Villa Nova, Pa., a car of horses in a freight train caught fire and was badly damaged. The man in charge of the horses jumped off and was injured.

3d, on Colorado Midland near Parachute, Col., the engine of a passenger train was badly damaged by the breaking of a driving rod. The engineman was slightly injured and had to cling to the roof of the cab to save himself until the fireman stopped the engine.

8th, on Lehigh Valley, at Hayes Creek, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler; fireman and 2 brakemen killed.

9th, on Baltimore & Ohio, near Wilmington, Del., 10 cars in a freight train were crushed and broken by the sudden application of the air brakes.

A summary will be found on another page.

The Gibbs Spring Controller.

The accompanying engravings represent a device invented by Mr. Geo. Gibbs, Mechanical Engineer of the Chicago, Milwaukee & St. Paul which is intended to so control the motion of a spiral spring as to give it the smoothness of action of an elliptic spring. The difference of action in these two classes of springs is due mainly to the friction between the plates of the elliptic spring which gives it the easy action so desirable on locomotives, tenders, cabooses and passenger equipment. Mr. Gibbs' device is intended to supply to spiral springs the required amount of friction at a small additional cost.

Fig. 1 shows in elevation the "vibration damper" as it is called, and fig. 2 an end elevation of the same in position between the spring plank and bolster of a truck. Fig. 3 shows in detail the construction of the device. To the under side of the bolster is fastened a casting having a length equal to the width of the bolster. Lengthwise through this casting is a heavy pin over which is folded a sheet of iron or steel of a width equal to the distance between the lugs of the casting and long enough for the ends to reach about three-fourths of the distance to the opposite timber. Another sheet is hung from a casting on the spring plank, but instead of bearing directly upon the pin it bears upon a casting through which the pin passes, this casting being so much larger than the pin that the folded sheets from below will lie flat against those from above. The casting over which the lower sheet is folded projects upward to a point somewhat past the center, its thickness being equal to the diameter of the pin above. Through these plates and the casting pass two bolts provided with small springs and washers, so that a considerable pressure can be exerted between the plates. This arrangement permits the pressure between the plates and the consequent friction to be so adjusted as to produce the desired result.

In fig. 4 are shown by diagram the results of experiments on the vibration of springs. The long diagram shows the vibrations of an ordinary four-coil spring under a suddenly applied load, the spring coming to rest after about 45 seconds. The lines of this diagram read from left to right. The diagrams below show the vibrations, under similar conditions, of the same spring tested with a damper, and of an elliptic spring. These two diagrams are very much alike and show that both springs come to rest in a little more than 2¼ seconds. Tests of the springs in actual service with this device show equally satisfactory results.

Another form of this device is used for dampening the rocking motion on street cars having short wheel bases, one being placed at each corner between the truck frame and car body. This not only makes an easier riding car, but lessens the destructive action to the car itself.

The Drexel Railway Supply Co., of Chicago and New York, is introducing this device.

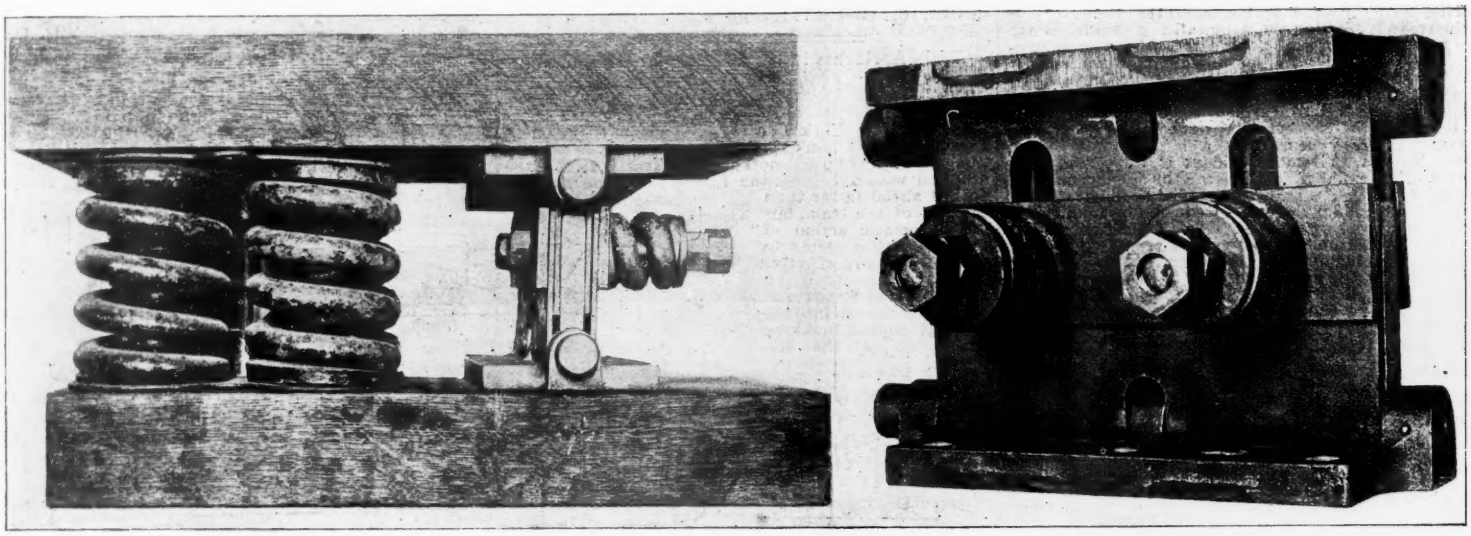


Fig. 2. Fig. 1.

The Gibbs Spring Damper.

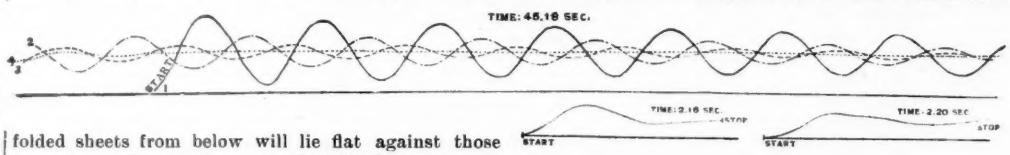


Fig. 4.

The Improved Serpollet Boiler.

Since the Serpollet boiler was first brought out in France important modifications have been made in its design which are shown in a recent issue of the *Revue Industrielle*.

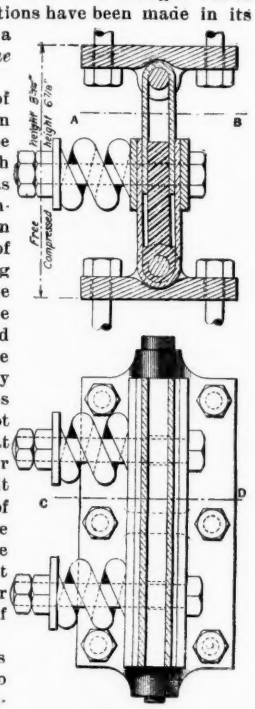


Fig. 3.

The prominent feature of the Serpollet boiler has been the use of a capillary tube —resembling a tube with very thick walls, which has been flattened out so completely that a cross section is an almost solid mass of metal with the opening through it merely a fine crack. The tubes, in the early boilers, were arranged in a spiral, and while the results were thoroughly satisfactory in the sizes tried, the system was not adapted to boilers of great capacity. Ten horse-power seemed to be about the limit of size; and a number of them of this power were built and applied to the propulsion of the Serpollet steam carriages, a familiar vehicle on the streets of Paris.

In the later designs it has been found expedient to abandon the spiral arrangement of tubes and to modify the shape of the tube itself. An inverted U, or gutter section, has been adopted, and the tubes arranged in straight lengths, joined by return bands, and placed over the furnace in staggered rows. The several tube sections are connected in series, forming practically continuous lengths of tubing, the water being fed in at the hottest part, immediately over the furnace, working its way successively through the different rows and being taken off at the top as steam. In both the old and the new form of Serpollet boiler the water passes into steam immediately on entering the tubes.

The new cross section, it is claimed, adds considerably to its resisting powers, and the arrangement of the tubes in separable lenghts and rows permits and enables the ready turning out of boilers of larger capacities than

was possible with the old form. A street car has been equipped with the new boiler and is now in regular operation, running between the Place de la Madeleine and the Place Clichy. Safety and lightness are features of the generator to which attention is called by its inventor.

New Electric Railroad Equipment.

The Westinghouse Electric & Manufacturing Company, No. 3 single reduction motors have been so successful in street railroad service that the company has been encouraged to bring out two new types which are designated as Railroad Motors No. 10 and No. 12.

In the new types are retained the circular form of field with four poles, the toothed armature and the two circuit winding and lathe-wound coils, all of which features the company considers unsurpassed. Three

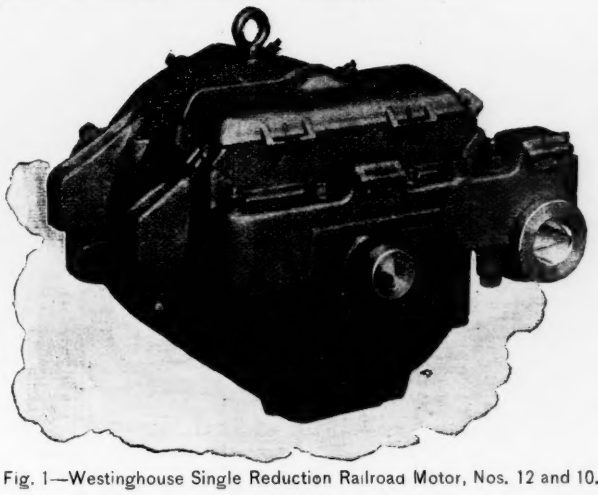


Fig. 1—Westinghouse Single Reduction Railroad Motor, Nos. 12 and 10.

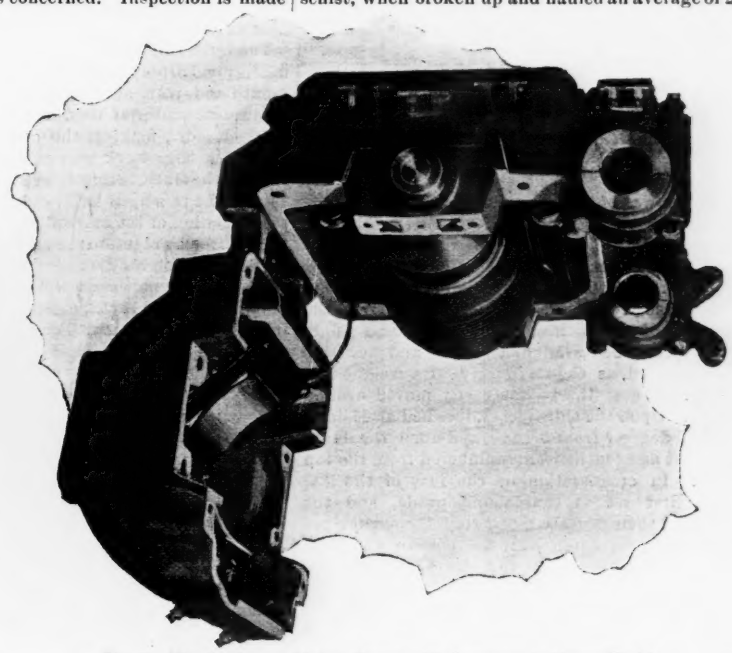


Fig. 2—Westinghouse Motor, Open, with Armature in Upper Field.

sizes of the No. 12 type are built, respectively of 20, 25 and 30 H. P. No. 10 is a heavier class and is made in two sizes of 40 and 50 H. P.

The motor is shown in fig. 1. It is suspended by bars resting on springs which are in turn sustained by cross-bars bearing on the truck, which practically relieves the axle of the weight of the motor, and avoids hammering. It is suspended in a gravity line and, having a rotative movement about the axle, the position of the gears is not changed.

A special feature of these motors is the accessibility to the fields and armature. Besides the provision of a

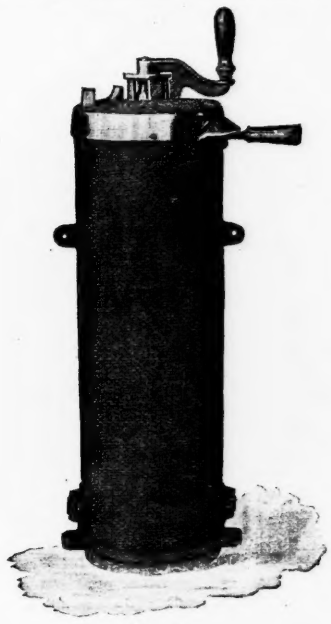


Fig. 3.

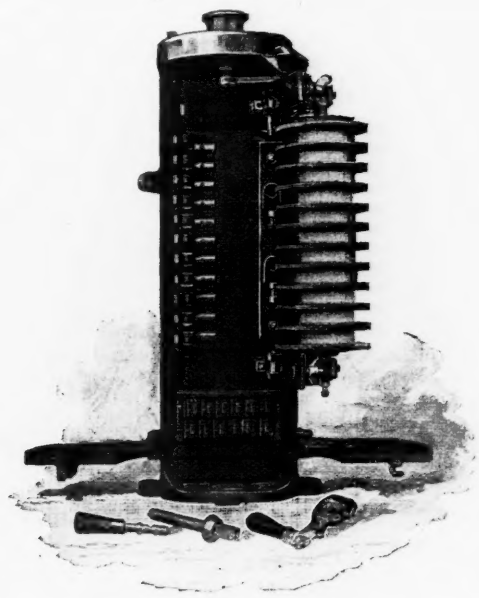


Fig. 4.

Westinghouse Series Multiple Controller, with and without Cover.

hinged lid on the top that gives ready access to the brushes and commutator, and an opening in the lower field, the whole interior of the motor may be opened as shown in fig. 2. The armature bushings are carried in pillow blocks, which are secured to both the upper and lower fields. By removing the bolts holding the pillow blocks the lower half may be let down either without the armature, as in fig. 2, or with it. This is easily accomplished by the use of a rope passed around the axle, which answers for a pulley block. With such open access all repairs can be made from the pit, which keeps grease and dirt out of the car.

In addition to the above features pointed out these motors have the following characteristics: Light weight, ample capacity of the armature and field windings, large bearing surface in the journals, protection from external injury, very high efficiency, great starting torque. They have also forged steel pinion with mild steel gear of special quality, giving great toughness, and tapering pinion seat on armature shaft. The speeds of these new motors are about the same as the No. 3 class.

Next in importance to the motor is the controlling apparatus, and the company offers a new and improved controller stand, No. 14, shown in figs. 3 and 4. Two handles are provided, one for controlling the speed and the other for reversing. They are fitted with locking devices which prevent their removal except in the position of no current. They are similar to the old type so far as the motor man is concerned. Inspection is made simple and easy as show in the figures 3 and 4; the controlled drum being supported on hinges which permit its being swung clear of the contacts. The controller is made both fire and water proof. The cover of sheet iron, lined with abestos cloth, is easily and quickly removed. The cylinder or drum is built up of thick porcelain and vulcabeston rings. The controller has a double back in which are located the wires and connections, so that any danger from grounds or short circuits within the controller is avoided. The reversing handle projects from the side of the stand. A single throw of this switch reverses the current in both motors. The controller throughout is of the best workmanship, and the parts subject to the greatest wear can be quickly and cheaply replaced.

Harper's Ferry Improvement.*

At the meeting of the American Society of Civil Engineers, April 18, Mr. W. L. Sisson presented a paper describing the changes that have been made at Harper's Ferry. The location at this point was a makeshift, and the old bridge had become a complicated and patched-up structure. The main features of the new location are those proposed by Col. J. L. Randolph, a former chief engineer of the road. Owing to the rugged topography of the country and to obstacles, it was necessary to locate some of the points of the curves and piers by a system of triangulation—in fact, by five systems of triangulation. These successive triangulations depended one upon the other, and it is very gratifying to the Engineer, Mr. Sisson, that the work came out so very closely, the error on the final location being only two-tenths of a foot.

The work of construction involved in making the changes for the Harper's Ferry improvement was as follows: From Island Park one-half mile east along the bluffs on the West Virginia side of the river there were 50,000 cu. yds. of solid rock cutting, the cuts in some places being 80 ft. high. The rock, limestone and mica schist, when broken up and hauled an average of 2,600 ft. to embankment, made nearly 90,000 cu. yds., an increase of 80 per cent.

Bridge and Foundations.—The river bridge consists of four deck spans of 85 ft. 6 in., three through spans of 140 ft., one deck span of 100 ft., and one half-through span of 34 ft. 6 in., making a total length of 896 ft. 6 in. The piers of the bridge, eight in number, are set at an angle of 73° 45′ with the center line, and are 6 × 37 ft. on top, and from 34 to 36 ft. high above neat line, and are located directly opposite and on a line with the piers of the old bridge, so as to obstruct the waterway as little as possible, and are on a grade of 0.3%, the coping of them being level. They are built of Gettysburg granite and are founded on solid rock. The rock, being generally uneven and full of crevices, was prepared by cutting away the loose or decayed portions of it and then leveling with concrete, mixed in the proportion of 1 part of Portland cement, 2 parts of coarse sharp river sand, and 5 parts of broken stone.

While putting in the foundations the depth of water was about 6 ft. In several cases the Wakefield sheet piling was used for the cofferdams with good results, both as regards cost and efficiency.

SUBSTRUCTURE OF BRIDGE.

Excavation at 75 cents.	Masonry, 1st class, at $10.	Masonry, Rubble, at $5.	Masonry, Concrete, at $6.69.	Masonry, Cement, at 85c.	Total.	
Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Bbls.	Cu. yds.	Cost.
2,406	3,552	1,404	340	4,068	5,296	$49,910

The superstructure is of mild steel, except the eye-bars, pins and rollers, which are of medium steel, and is designed for a moving load on each track of two 125-ton consolidation engines, coupled, followed by a train load of 4,000 lbs. per linear foot.

The through spans are single intersection Pratt trusses, 137 ft. c. to c. of end pins, 30 ft. high and 23 ft. 4 in. c. to c. of trusses. The deck spans, of 85 ft. 6 in., are plate girders, three to each span, 85 ft. out to out of girders, 9 ft. center to center of girders, and 7 ft. 10 in. deep. The 100-ft. deck span consists of three plate girders 7 ft. 10 in. deep, 9 ft. center to center of girders, and 99 ft. 8 in. out to out. All of the spans are for double track, except the two at the west end of the bridge, which are built for two main line tracks, and the one of the Valley Branch, which here forms a Y, the space between the two branches being spanned by plate girders and floored over for a platform.

Tunnel.—A double-track tunnel 812 ft. long begins 103 ft. from the east end of the bridge and extends through the mountain spur at this point. The rocks are mica schist with quartz seams, passing into micaceous gneiss, and dipping to the eastward. The strata in places are much contorted and broken. The west portal is at the foot of a cliff 250 ft. high, the approach cut here being 70 ft. and at the end of bridge 40 ft. At the east end the portal slope of the cut is 112 ft. on the upper and 40 ft. on the lower side. The tunnel was driven with Ingersoll-Sergeant drills worked by compressed air supplied by a compressor at the east end of the tunnel, pipes being laid around the foot of the mountain to supply the west end drills. The headings were 8 × 25 ft., the full top section of the tunnel, and were kept only 15 ft. in advance of the bench, as no timbering was necessary. The rate of progress for heading and bench in the east end was 18 ft., or 491 cu. yds. per week, and in the west end 19 ft., or 423 cu. yds.

* A preliminary description of this work will be found in the *Railroad Gazette* of Nov. 4, 1892.

It was considered necessary to line 80 ft. of the west and 45 ft. of the east end, both portals being in the open cuts about 10 ft. from the ends of the tunnel. The

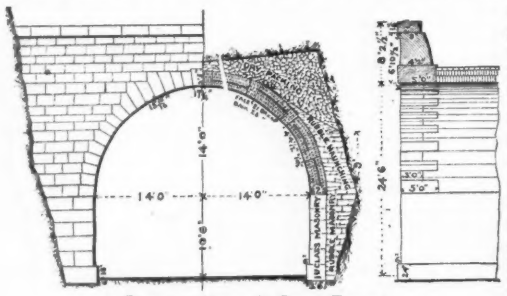


Fig. 1.—Harper's Ferry Tunnel.

arched portion was of the same size in the clear as the remainder, the arch being built of five rings of bricks, with bench walls of first-class masonry 2 ft. thick, backed with rubble masonry carried up to a point 9 ft. above the springing line, the remainder of packing being stone placed by hand, fig. 1. In estimating the actual amount of tunnel excavation, and finding points within the prescribed section, a simple and accurate machine was used, as shown in fig. 2. Its weight was about 90 lbs. and cost $4. It was easily moved around by two men. Upon the side pieces, inclined at 45 deg., were marked degrees from 0 to 90, and upon the lever or pointer feet and tenths were numbered from the top downward. In cross-sectioning the foot of the machine was first set at center and grade, and the vertical pieces, then plumbed, bringing the center pin at center on the springing line; the pointer was then run out to any desired place, and the distance on the pointer to the center pin, and also the angle on the inclined piece, noted. In this way the measurements and angles taken above the springing line formed a series of triangles, which were calculated by the rule: area = product of the two sides and sine of included angle divided by two. In using the machine merely for finding points within the prescribed section, the inclined and horizontal sidepieces were removed and only the pointer used. It will be readily seen that the relative proportions of the different parts insured very accurate results.

The disposition of the tunnel material was made as follows: 5,800 cu. yds. was crushed into 10,472 cu. yds. of ballast by a Gates' Crusher No. 4 at the east end, and by a Blake at the west end; then loaded into cars and shipped to different parts of the road. The remainder, 16,482 cu. yds., was used for the embankment east of the tunnel and for raising the county road and the main-line tracks between Sandy Hook and the tunnel.

QUANTITIES AND PRICES.

Excavation:		
Solid rock, approaches, at 75c	23,313	cu. yds.
" " tunnel at $2.10	19,838	"
Overhead at 1c	132,263	"
Tunnel masonry:		
Lining, first class, at $9	195	"
Arching at $9.50	415	"
Packing rubble at $5	156	"
" haunching at $2.50	288	"
Dry packing at $1.50	1,215	"
Cement at 85c	1,005	bbls.
Portals (total cost $1,640)	161	cu. yds.
Total cost	$76,779	

Changes in Alignment.—For 2,750 ft. the alignment and grade of the old main line had to be changed to

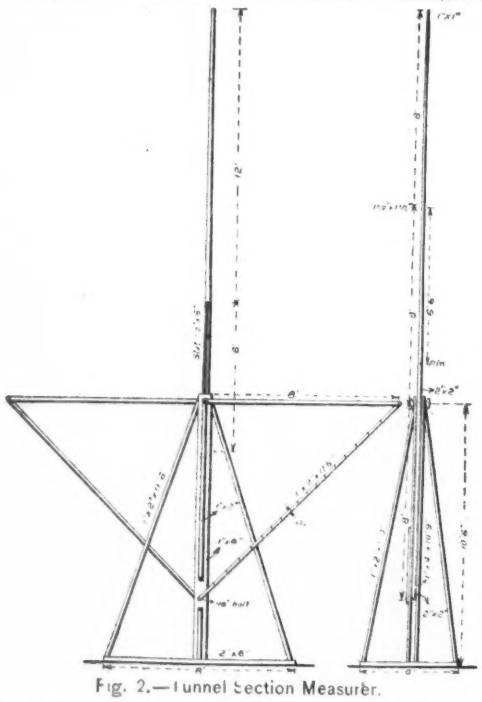


Fig. 2.—Tunnel Section Measurer.

properly connect with the new line, and, while making the change, still maintain the travel. This was done by first laying a third track parallel to the main line tracks. Between these points the former eastbound track was used as westbound, and the third track used as eastbound track, after having been connected with the west and east bound tracks of the main line. The former westbound track, having been cut loose, was then raised to its full height to conform to the new grade. When the remainder of the work was completed, the road was operated by connecting and distorting both tracks until the new embankment was widened out to its full width, which here occupied both of the old tracks; the position of both tracks was then gradually shifted until it finally corresponded to the new alignment.

The force engaged in raising track was: 1 foreman, 10 men, for 120 days, which, with foreman at $50 per month and men at $1.15 per day, cost $1,617.69. The amount of material used to make this raise was about 5,000 cu. yds., making the cost per cubic yard about 32 cents. The work was necessarily slow and expensive, as the track had to be kept in good line and surface during the raising of it. The above cost does not include the widening of the embankment.

Trestle.—The improvements include also a double track trestle of an average height of 18 ft. above pedestals. At the north end of the trestle there is a 3-deg. 54 min. curve for 190 ft., compounding them into a 7-deg. 10 min. for 180 ft., and then a 2-deg. for 100 ft., the remainder being tangent. In some places the old trestle was 18 in. off of the new alignment, the change being made as the new trestle was built. In building this a temporary single-track trestle was built from Station 1 + 40 to 0 of the Valley connection, and from there on one-half of the permanent trestle was built and used for main track until the other half was raised (the temporary one being then filled in). The new bents were so located that none of the old ones was disturbed until both tracks were in operation.

The 60-ft. half-through span at the south end of the trestle was raised by removing (between trains) some of the blocking from under the new trestle (which had been first carried across the bridge on blocking) and jacking the whole span a corresponding distance, until the final height was attained.

From this end of the trestle, south 1,800 ft., the tracks of the Valley Branch were raised, one at a time, to conform to the new grade, which at the trestle was 5 ft. 9½ in. higher, and 1,800 ft. farther south ran into the old grade. The force engaged in raising the first track was, 1 foreman, 10 men, for 45 days, which at $50 per month for foreman, and $1.15 for men per day, cost $604. The amount of stone required to make this raise was 1,935 cu. yds., making the cost per cubic yard about 31 cents.

SUMMARY OF WORK.

Classification.	Amount.	Price.	Cost.
Earth excavation	4,896	$0.18	$891.28
Loose rock excavation	4,880	0.35	1,710.00
Solid rock excavation	27,769	0.75	20,826 75
Solid rock excavation	45,000	0.78	35,100.00
Water excavation	2,406	0.75	1,804.50
Tunnel excavation	19,868	2.10	41,722.80
Overhaul	782,263	0.01	7,822.63
First-class masonry	3,552	10.00	35,520.00
Second-class masonry	716	8.00	5,728.00
Concrete	340	6.20	2,108.00
Contrete	75	4.85	363.75
Rubble masonry	4,643	5.00	23,215.00
Paving	90	2.00	180.00
Portal masonry	164	10.00	1,640 00
Tunnel arch masonry	415	9.50	3,942.50
Tunnel side walls	194	9.00	1,746.00
Haunching over arch	287	2.50	717.50
Dry packing	1,214	1.50	1,821.00
Arch culvert masonry	142	9.00	1,278.00
Cement (Cumberland hydraulic)	6,400	0 85	5,440.00
Cement, Portland	600	2.20	1,320.00
Incidentals			7,500.00
Raising main line and valley tracks			2,225.00
Renewing and raising trestle			17,141.05
Ballast crushed from tunnel material	10,472	0.45	4,712.40
Bridge foo overhead crossing			585 00
Potomac River Bridge			70,000.00
Bridging on the Valley Branch			2,500.00
Moving station 100 ft. and lifting 3 ft. (station 75 × 30 ft.)			250.00
Engineering			5,500.00
Total			$305,311.16

The Hampson Flexible Iron Coupling.

The illustrations show a new patent coupling for train pipes, on the idea of a Hooke' universal joint. Its construction is clearly shown in fig 1. It consists of two yokes, one arm of each of which is hollow, and a central cross, two arms of which are hollow and connecting. The hollow arms of the cross connect with and form a passage between the parts of the two yokes. These two yokes form the ends of the steam pipes. Fig. 1 is a section of the central cross and of one yoke, and plainly shows the passage through the joint. The joint is held together by spindles or gudgeons that pass through the collar of the yoke and screw into the cross. The spindle of the yoke arm that contains the port is also hollow and cut out on one side to allow the pasage of steam or air.

Packing is provided between the hollow gudgeon or spindle and the yoke arm, to insure a tight joint. Some other features that are claimed are that there are no ground joints, that the whole joint is made of malleable iron, that it can be repaired at short notice without being removed from the engine or car. The passage is free and unobstructed no matter what the angularity of the pipes to which the yokes are connected, and is calculated to save the cost of renewal attendant on the use of hose couplings. Each yoke permits a movement at right angles to the movement of the other, and the result is a universal joint. Fig. 2 is a perspective view of the coupling with the yokes oblique to one another; and fig. 3 shows a connection complete.

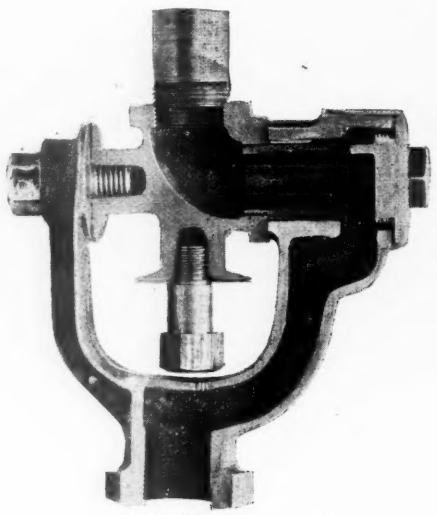


Fig. 1.

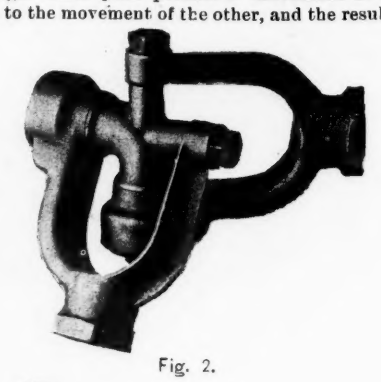


Fig. 2.

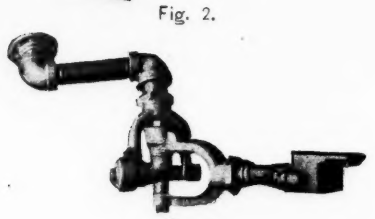


Fig. 3.

The Hampson Flexible Coupling.

All couplings are tested to 200 lbs. per sq. in. hydraulic pressure, and tests at the Institute of Technology with steam at 150 lbs. showed that the joints would move at any angle under its own weight and without leaking. The coupling has been applied to engines No. 173 and No. 116 of the Boston & Albany road, to No. 35 of the Fitchburgh road and on the car-heating plant of the new Union station at Boston. In all these cases it is said to have given satisfaction. The inventor is Mr. Wm. H. Hampson, and the coupling is sold by F. A. Barbey & Co., 215 Franklin street, Boston.

Foundations of the Chicago Stock Exchange Building.

The nature of the material underlying the city of Chicago has made the subject of foundations one of great importance in the design and erection of heavy buildings. The site upon which the city stands was at one time a swamp, the highest point in the original plat being only about 5 ft. above the high-water level of the lake. The grade of the streets has been raised until the curb line is now about 14 ft. above datum or low-water level. Underneath the filling and surface soil is a bed of clay, very irregular in depth and varying in consistency from very soft to firm. The variations in thickness and texture of this bed are often very abrupt, so much so that in all important works a complete set of borings is considered indispensable before determining the size and location of the foundations. The sustaining power of the clay varies from 2,500 to 4,000 lbs. per sq. ft., 3,000 lbs. being a frequent loading employed. Under this loading there will be more or less settlement, and it is important that foundations should be so distributed as to make the settlement uniform: also to allow from 3 to 5 in. for settlement according to the weight of the building and the character of the soil.

The *Railroad Gazette* of Oct. 30, 1891, contained a very comprensive article on the construction of tall buildings in Chicago, in which was detailed the usual methods employed for securing safe foundations. In the plan most generally followed, it is customary to start with a heavy course of concrete laid on the clay, which has been leveled off at a suitable depth for the purpose; upon this are laid several courses of steel rails or "I" beams, the several courses laid at right angles to one another, and the spaces between them filled with

concrete. The upper course is surmounted by a cast iron base plate, into which the column is set. While, with careful management, this method gives good results, numerous cases of unequal settlement can be noted. Rock is encountered at a depth of from 60 to 100 ft.; overlying this is a bed of hard clay of variable thickness. A few of the buildings in the business district are built on piles, though many of these piles are so placed and driven that they sustain but a small part

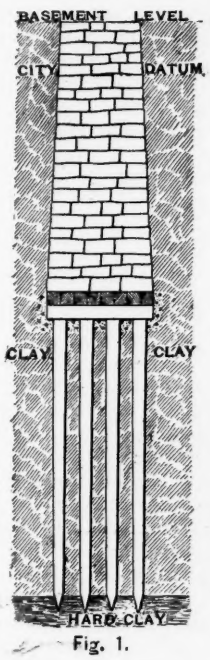


Fig. 1.

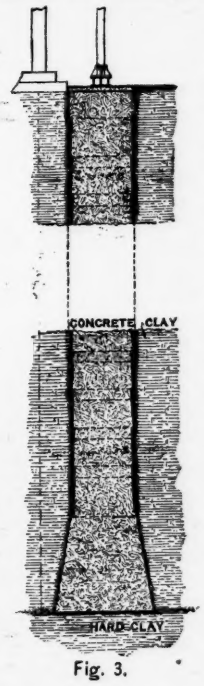


Fig. 3.

of the load they would be capable of carrying if properly driven.

Gen. Wm. Sooy Smith has for many years been an earnest advocate of pile foundations. His views on the subject are embodied in an address delivered before the engineering classes of the University of Illinois about two years ago and appearing in the *Railroad Gazette* of June 24, 1892. Briefly stated the plan proposed by General Smith is to drive piles in a pit or trench 25 or 30 ft. deep, the piles to be driven to rock or well into the hard clay and sawed off below the level of the lake or of any system of deep drainage likely to be adopted; these piles to be capped with heavy timbers, and masonry or concrete columns or walls to be built thereon. By this plan all settlement is believed to be avoided, and the piles and timbers, being constantly under water, are practically indestructible. Fig. 1 shows a section of the walls and foundation under the new Public Library Building.

Among the buildings recently constructed or in process of erection on pile foundations are the Illinois Central station at 12th street, the Art Institute, the new Public Library, the Schiller Theatre, the Medina Temple and the Chicago Stock Exchange Building. In the case of the last-named building, now being erected on the southwest corner of La Salle and Washington streets, with a frontage of 101.4 ft. on Washington street and 181.9 ft. on La Salle street, and 13 stories high, the problem of foundations was one of especial importance, as it is adjoined on the west by the new Herald Building, while across the alley on the south side is the Oriental Building, a five-story building of old construction. The clay at this point is as soft as has been encountered in any part of the city. The conditions were such that pile foundations seemed especially desirable, yet it was quite out of the question to drive piles so close to the Herald Building as would have been necessary in supporting the building wholly upon piles. The foundation plan finally adopted was that shown in fig. 2, all footings resting on pile foundations except those near the Herald Building. These rest on foundations made by excavating wells down to the hard clay and filling the same with concrete. In making the excavations, the sides of the well were supported by oak sheathing held in place by steel rings as shown in fig. 3, the sheathing being put in place as fast as the excavation progressed. These concrete foundations vary in diameter from 5 ft., to 6 ft. 4 in., increased at the base to 6 ft. 6 in. and 8 ft.

The excavations were made and the foundations put in without in any way disturbing the Herald Building. The Occidental Building showed a slight settlement, though no movement of the clay could be observed, and it was probably due to shrinkage of the soil from loss of moisture. Piles driven previous to the excavation caused no trouble whatever.

The work of driving piles was commenced on July 5, a steam hammer being used having a total weight of 8,400 pounds. The striking part of the hammer weighed 4,400 pounds and had a stroke of 3½ ft. The 728 50-ft. piles used were all driven by Aug. 6, and were so spaced as to sustain a calculated weight of 30 tons each. The piles are capped by 12-in. timbers laid parallel to the short side of the lot and tying together such foundations as are in line. Upon these cap timbers a grillage of 12-in. timbers is laid in the opposite direction, but covering only the foundation itself. A bed of concrete was placed upon the platform thus formed, and one or two courses of steel I beams laid upon it, the space between the I beams being filled with concrete and the foundation built out with concrete to the lines shown in fig. 4. This represents a row of foundations on the line *E F* of the plan, the one at the left being one of the deep concrete foundations next to the Herald Building. This foundation is tied to the pile foundations by five 20-in. I beams, upon which rest the cast-iron base plates for columns. The total amount of steel beams used is about 125 tons.

It will be observed that the foundations occupy but a small portion of the area covered by the building. With the ordinary platform foundations and a loading of 3,000 lbs. per square foot, the foundations would cover about three-fourths of the area of the lot and would of course require a much greater amount of steel and concrete. The foundations would not only be greater in area, but in depth as well, in order to obtain the requisite stiffness and bring the unit stress within safe limits. The additional amount of concrete, steel and labor required in a platform foundation appears to be about equal in cost to the expense of material and labor in driving piles, as the claim that pile foundations cost no more than the usual platform foundations seems pretty well established. The most of the piles are driven in rows three feet apart and three feet from center to center and are sawed off at depths of from two and a half to six feet below the datum line. The foundations are in most cases entirely below the floor line, thus economizing floor space.

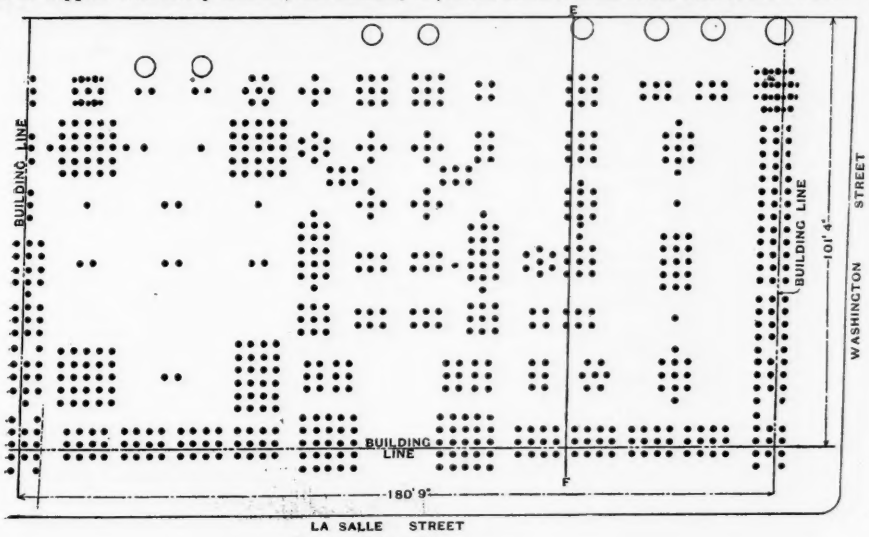


Fig. 2—Piling Plan.

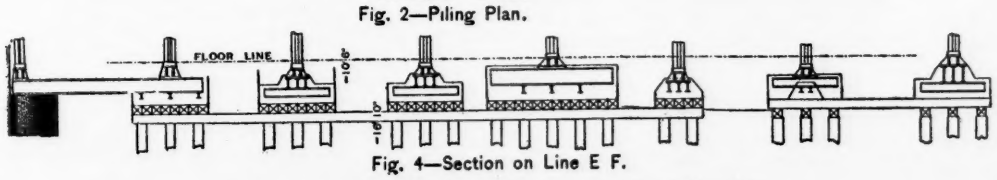


Fig. 4—Section on Line E F.

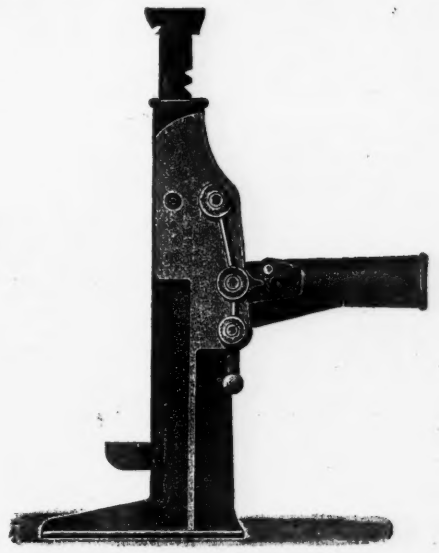
FOUNDATION FOR THE CHICAGO STOCK EXCHANGE.

In the case of one of the buildings mentioned above, bids were received both on pile and platform foundations. For pile foundations $18,000 was asked, and for the usual platform foundations $26,000, a difference of over 30 per cent. in favor of piles. These figures may not be representative of the average case, as the circumstances may have been peculiarly favorable to the use of piles, but they are at least instructive.

The architects of this building are Adler & Sullivan, a firm well known as the designers of the Auditorium, the Schiller Building and other important buildings. The foundations were put in by Gen. Sooy Smith.

The Stilwell Railroad Jack.

A new jack for track and other uses has recently been brought out by the Stilwell-Bierce & Smith-Vaile Company, the general appearance of which is shown in the illustration. As will be noted the design makes the frame very stiff and liable to spring but little when the



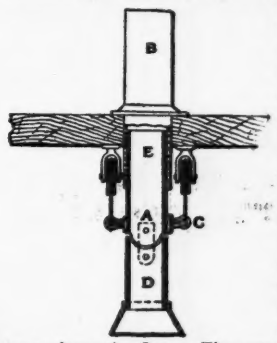
ever is being operated. The frame is of malleable iron, the rack and pawls of forged steel, and the bearings of machinery steel. The load may be carried either at the upper end of the bar or on the foot at the base.

The arrangement of pawls is such that the load may be raised one-half of a notch or a full notch, but the load is absolutely still during the downward movement of the pawl.

An Adjustable Smoke Funnel for Roundhouses.

An adjustable smoke funnel, which has been found entirely practicable and convenient, is shown in the illustration. The funnel is the design of Mr. H. W. Goodridge, of the Pittsburgh, Cincinnati, Chicago & St. Louis, at Chicago, and Mr. Charles Jonsson.

The funnel is shown as at first designed. There is a stationary section *B*, which is secured to the roof of the building. Inside of *B* is the section *E D*, the height of which is adjustable. The adjustable section is supported by two ropes attached to the lugs *C* and extending over the pulleys which latter are screwed into the roof timber. Beyond the pulleys, the two ropes become one, and this one extends to the side of the roundhouse and down the wall to within convenient reaching distance from the floor. The counterweight is attached to the single rope.



Since the funnel was put in service it has been found that a lever, the fulcrum of which is fastened to the roof timber, with suitable connecting links, gives better satisfaction than the double rope and pulleys. A rope at the end of the lever extends to the floor, as in the other case, and the counterweight is fastened to it.

The adjustable section *E D* is in two parts, *D* being suspended from *E* by two links, one of which is shown pivoted at *A*. The part *D*, therefore, is free to swing in the plane of the paper, gravity keeping it in line with *E*. The funnel is easily adjustable within the limit of variation of heights of locomotive stacks. The object in hinging the part *D* is to prevent damage being done to the funnel or stack should it happen that a locomotive be moved when the funnel would engage with the stack; with this device the lower end of the funnel would be swung out of the way and uninjured.

The funnel is in use at the Chicago roundhouse of the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday.
At 73 Broadway, New York.

After May 1, The Railroad Gazette office will be at **32 Park Place,** *one block west of the Post-Office.*

EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

When this issue of the *Railroad Gazette* is in the hands of its readers the office of the journal will have been moved to **32 Park Place.** For exactly 21 years the paper has been published at No. 73 Broadway, and we naturally regret leaving rooms which have become familiar to so many of our readers, and about which so many agreeable associations have gathered. It had become important, however, to get into larger and more convenient quarters than could be had in the old building which we had so long inhabited, and such quarters have been found at the new address. The new office of the *Railroad Gazette* is in the Metropolitan Life Insurance Building, at the corner of Park Place and Church street, close by the Park Place station of the Sixth Avenue Elevated Railroad, within one block of Broadway and the Post Office, and will be found as accessible for most of our friends as the old office has been.

The complaints against the Official Freight Classification of the Trunk Lines and Central Traffic Association roads, which were so loud last January, have had the desired effect (or at least a marked effect; the complainants wanted more than they got, of course), and a new classification has been issued, to take effect May 1, in which the rate to be charged a shipper who refuses to accept the conditions of the uniform bill of lading is only *twenty per cent.* higher than the ordinary rate, instead of one class higher, as has been the case hitherto. This is a sensible change. In raising the price just the difference between one class and the next one, the penalty imposed upon the shipper who insisted on having his own way was often outrageously high, while now it will be uniform. Twenty per cent. may be too high in many cases, but the question whether it is or is not just right, is not a very important one. The true ground for making this difference in rates is that the railroad company can rightfully favor such shippers as will co-operate in the effort to have all freight transported under a contract in which the complicated question of legal liability has been so defined and limited as to simplify and minimize the questions of law that will arise in case the goods are lost or damaged; and the percentage of increase ought to be large enough to discourage shippers who insist on their rights from mere crankiness or ignorance while small enough to reduce the necessary friction to a minimum. If the latter aim is accomplished the amount of the percentage is not a serious question, for very, very few shippers will pay the extra amount, after the excitement has subsided. With the question of negotiability out of the way, the uniform bill of lading will probably cause no more friction than the generality of such contracts that have been in common use for the past 25 years.

At the same time the committee which formulates the bill-of-lading contract might well consider whether it would not save itself and the local agents, claim agents and general freight agents a great deal of annoyance by toning down some of the conditions of the bill. While these conditions are in most cases no stronger than the courts would sustain, it is probably true that the money that they save to the railroads is far less important than the friction that they produce. It is only four years since this same complaint was up before. It may be argued that the various merchants' freight bureaus want some kind of an excuse for a controversy at least as often as every four years, and it is probably true that the grievance this year was based on theoretical rather than practical wrongs, but it is well to take the friction out of the machine when you can. However unfounded may be a shipper's claim, the conditions of the bill-of-lading, like the page of fine print conditions in a fire insurance policy, always afford a good target for the ridicule of the lawyer when he gets before a jury. To try to make the shipper liable for every delay due to "stoppage of labor," gives him the impression that the road does not mean to guard against strikes with much energy. To make him ship a machine entirely at owner's risk because it has to go on an open car is in many cases an outrage, and he is not to blame for getting mad about it. And as long as so much freight is shipped without any receipt whatever, it will be hard to convince shippers that elaborate conditions are vital to good business methods. Moreover, the business men have not got through complaining. The New York Produce Exchange, encouraged by the action of the Grand Trunk, has just started to agitate the bill-of-lading matter; and from Chicago it is reported that another road has adopted a common-law receipt.

A correspondent wishes to know what the meaning of "trunk line" is, and how the term originated. The term has come to have more than one meaning, but originally the "trunk" line meant the main line of any railroad to distinguish it from its branches, and it is still used more or less in that sense of considerable roads which have systems of branches. But as the railroad system grew in this country a line which served as an outlet for a considerable part of the system came to be regarded as a "trunk," though it might have no branches of its own, the lines which brought it traffic, though perhaps trunk lines themselves, with branches of their own, standing in the relation of branches to it. And as a very large part of the through traffic of the country was concentrated on the railroads from the Northern seaboard cities, Boston, New York, Philadelphia and Baltimore, to Buffalo, Pittsburgh, Wheeling and similar points, it has become common to designate these roads as "the trunk lines," without any qualifying epithet, though we usually say "Eastern trunk line," when there seems any danger of being misunderstood. The lines which extend these roads farther west to Chicago, St. Louis, etc., are commonly called, in railroad jargon, "trunk line connections," by which trunk line extension is meant, a great many other lines being just as much as these "connections" of the trunk lines, and these being themselves "trunk" lines, and often popularly called so; so that the average citizen perhaps thinks of the whole line from New York to Chicago as the "trunk line" when the term is mentioned, quite as often as the line from New York to Buffalo. The railroad main lines from Chicago to Omaha, to St. Paul and to Kansas City are, properly, "trunk" lines for their widespread branches, and there are Southern and Pacific trunk lines; but the term is rarely applied to these roads. The general term tends to become specific, applying to a comparatively small number of railroads extending westward from the Northern seaboard, and serving as Eastern outlets for a very large proportion of the whole railroad system.

The Use of Small Anthracite for the Prevention of Smoke.

There has been, and still is, considerable talk about the use of small anthracite in and about some of the great cities, with a view to reducing the amount of smoke.

The subject has been discussed to some extent in New York City recently in consequence of the introduction in the state legislature of a bill to appoint state inspectors to watch for offensive locomotives, and a correspondent inquires why we do not advise the railroads to use fine anthracite, which is inoffensive as regards smoke and costs much less than standard sizes. The proposed law has not been heard of lately and it has probably died a natural death. It ought to die, for the power already vested in municipal boards of health is ample protection to the public, and an additional state bureau would only be one more means of making politics profitable to those who go into it for profit.

From experiments which have been made with buckwheat and culm anthracite, two facts are already sufficiently apparent. Fine anthracite can be burned without trouble in locomotives and in stationary boilers without decreasing the capacity for steam production provided the grate area is increased where necessary; and the use of this fuel will practically do away with the smoke nuisance. Some tests of small anthracite on the Illinois Central were made in the spring of 1892, and the results were published in the *Railroad Gazette* of June 17 of that year. It was shown there that anthracite culm or buckwheat will evaporate more water per pound of fuel in a locomotive than bituminous coal. The grates in many stationary boilers and locomotives now using bituminous coal are large enough for the very small sizes of anthracite without any further change other than diminishing the openings in the grate to prevent the fine fuel falling into the ash pit. There are then no mechanical difficulties in using small hard coal; it is merely a question of price.

Here the limit is now found. When the subject was under active investigation in Chicago it was said that small anthracite could be sold there for about $1.50 a ton, but by the time that it was found quite practical mechanically to use these sizes in engines the price rose to such a point that they could not be used without serious increase in cost of working, and the matter was dropped. Investigations made at that time seemed to show that small anthracite could be sold in Chicago at a price low enough to permit its use in competition with Illinois coal, still leaving a good margin of profit for the producers. But the price seems to be entirely controlled by what will be paid for it by consumers and by the effect which the introduction of a low priced, fine anthracite fuel has upon the market for larger sizes. The offering of large quantities of small sizes of anthracite at low prices would reduce the consumption of larger sizes, as most people would prefer the finer sizes for household purposes, and so we should have the same fluctuations in the prices of engine coal that we now have in domestic sizes. As every one knows, chestnut is sometimes higher than stove size and sometimes lower, according to whichever kind there is a surplus of. Housekeepers can use either of these sizes without changing their grates and without inconvenience, so that it is all right for the coal operators to readjust their prices as often as necessary to work off any undue surplus of either kind, but in locomotives such frequent changes would be out of the question, for they would involve not only a change in grate bars but much troublesome instruction of firemen. Many locomotives could not be adapted to the fine coal at all except by enlarging their fireboxes, and it would not be worth while to do that unless a long period of usefulness for the remodeled firebox were assured.

The Chicago Elevated road (Alley) made experiments with fine anthracite which showed very clearly that the fuel could be burned in the present locomotives on that road without the least difficulty, but as soon as this fact was determined the price was raised to a point where it was no cheaper to use the fine sizes of anthracite than to pay $6 a ton for the large sizes, especially as the fine sizes were evidently not furnished by the producers with any intention of increasing the consumption of those sizes. This seemed evident from the fact that the fine coal had a larger mixture of dirt and dust. An analysis showed a very large percentage of ash.

For the coal operator who wishes to dispose of his surplus stock of buckwheat and culm the lesson of the experience that the railroads have had thus far would seem to be to offer some one road the small coal for a term of years at a price low enough to warrant the adaptation of the grates on a large number of engines to the new fuel. And he will probably have to do this of his own motion, for the railroad manager who aims to stop the smoke nuisance is not entirely dependent upon anthracite. By carefully training his firemen and not overloading his engines he can do very well with bituminous coal in all but a few exceptional cases. And for roads which run many passenger trains through tunnels we are not sure that we should recommend anthracite in preference to bituminous, for the gas from the former is to some people more offensive than the smoke from the latter. This point is worthy of note, for the passengers in the cars deserve as much consideration as the occupants of the houses along the road. And if we look at the question broadly it may be better for the railroads to be compelled to burn bituminous carefully than to be forced to use anthracite (a chief merit of which is that it can be used carelessly); for by far the larger part of the 1,000 million train-miles that are run in the United States annually must be run with bituminous coal; and anything that tends to increase the use of economical methods in burning this coal will benefit all parties—the railroads, their passengers and the people who live near the tracks.

Another Central African Railroad.

It is quite probable that the British Government will soon have to face the question of building a railroad from Mombasa on the Zanzibar coast to the north-eastern corner of the Victoria Nyanza. The lamented Sir Gerald Portal, who was sent to Uganda (the country on the northern shore of the Victoria Lake) for the express purpose of advising the government as to its proper policy, returned to London last winter and had prepared and submitted his report before his untimely death in January. That report has lately been made public and the government has avowed its purpose of establishing a British protectorate over Uganda as Sir Gerald recommended. The wisdom of this we shall not question. Africa has far more to gain than England from such a protectorate; and in fact so far as any commercial profit can come to England, for a generation or two at least, the occupation of this Central African country is a great waste of human energy. But the British Government feels that obligations have been devolved upon it which cannot be ignored and so, for good or for ill, but at any rate for the honor of the British Empire, the protectorate is to be established.

That means, in brief, setting up a government in the interior of Africa, 700 miles from the coast by the shortest caravan route, with great regions of practically waterless wilderness, and with strong and courageous hostile tribes between it and its base of supplies on the Indian Ocean. The difficulties of communication between deep water and the capital of the proposed protectorate are so prodigious that the carriage of goods costs now from $1,200 to $1,500 a ton. One may imagine the cost and danger of keeping up a government under such difficulties, and may doubt the possibility of developing an important commerce for many years to come.

But having taken the step of establishing this protectorate, shall a railroad be built? Will it pay to build it? What hope is there of its ever paying or coming near to paying? Fortunately, we have a scientific basis for some conjecture. Last summer an admirable report was made by Captain MacDonald, of the Royal Engineers, on a project for this railroad, and a short abstract of it was published in our issue of July 21. Captain MacDonald and his associates made surveys aggregating 2,724 miles, and settled on a railroad route 657 miles long, with comparatively good gradients and no great natural obstacles, and they estimated that a light railroad could be built and equipped complete, with rolling stock, stations, water stations and telegraph line for £2,240,000, say $11,000,000. This estimate was for 3 ft. 6 in. gage, steel ties 2,000 to the mile, and 50-lb. flat-footed rails. The charges on this capital at 3 per cent. would be $330,000 a year. The estimated traffic would call for three trains a week each way, paying in gross £61,000 a year at about two cents per passenger-mile and four cents per ton-mile, plus £1,000 a year for the mails. The estimated working expenses are £65,345 a year, leaving an annual deficit of £4,345, say $21,000. We have, therefore, an annual deficit, including interest, of $350,000. The officers making this report think it not too much to expect that their estimated traffic, which would be drawn from a country with probably 5,000,000 people, could shortly be doubled; that is, to 25,000 tons and 25,000 passengers a year, which at the rates per unit given above would net 3 per cent. on the capital. This is, however, very speculative, and the English Government must face an annual charge of $350,000.

Indeed we fear that Captain MacDonald's estimate of the traffic to be carried at once on the completion of the road, and the carrying of which would leave this very serious deficit, is too favorable. In fact the commerce to-day is really insignificant. Ivory is the only product which now reaches the coast at Mombasa, and but 25 tons of it a year is exported from that port now. Of course, cheaper carriage would increase the amount of ivory reaching the coast, perhaps double it, possibly treble it, but even then it would go very little way toward making a railroad pay, and there are natural limits to the amount of ivory that may be gathered in any country, however vasts. Elephants are big animals, and require much territory and time to develop in. A few years of active ivory trading aided by modern arms and a railroad, would very soon determine the limit beyond which the trade would begin to decline in volume.

It is true that wheat, maize and various small grains are grown in the country to the north of Victoria Lake, and in some of the country between the lake and the ocean; and it is true that the soil and the climate would lend themselves to a great increase in such crops. It is true also that there is considerable demand for breadstuffs along the Zanzibar Coast, and if they were put at tidewater cheap enough they might even be shipped farther. It is possible also to collect India rubber and various fibers in some of the country which this railroad would serve; but all this depends upon organized industry, and this estimated population of 5,000,000 people is a population of actual savages, who have very few wants and who would rather fight than work for what little they do want, any day. The man who counts on making money by the railroad business had better build his road among the populists of Kansas than among these savages. So of imports, the stuff that might be taken from the sea into the interior by a railroad is limited in kind and in quantity by the demands of a savage people and by their capacity to pay for what they take, and both are extremely small. So we say that the estimate of Captain MacDonald, judicious as it seems to be, is probably more favorable than actual conditions warrant.

Such, then, is the situation which the British Government has to face in considering this very interesting and important problem, for it is most important for the people of Africa, and less so, but still important, for those of England. If the British Government decides to build this railroad, it will have to explain to the people of the British Islands and to its subjects in India why the revenues of the Empire should be spent in building railroads for the benefit of savages in Africa and tradesmen in Manchester, when the British farmer and trader and the Indian wheat grower are suffering, or think they are, from too few railroads and too high rates.

March Accidents.

Our record of train accidents in March, given in this number, includes 40 collisions, 68 derailments and 4 other accidents, a total of 112 accidents, in which 22 persons were killed and 86 injured. The detailed list printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	8	0	0	8
Misplaced switch	0	0	2	2
Failure to give or observe signal	1	0	1	2
Mistake in giving or understanding orders	0	2	0	2
Miscellaneous	5	2	0	7
Unexplained	5	4	10	19
Total	19	8	13	40

DERAILMENTS:			
Broken rail	2	Track repairers	1
Loose or spread rail	2	Bad loading	1
Defective bridge	1	Bad switching	1
Broken wheel	0	Animals on track	3
Broken axle	5	Landslide	9
Broken tire	2	Snow	1
Broken truck	2	Malicious obstruction	2
Failure of drawbar	4	Sand drift	1
Broken car	1	Wagon at crossing	1
Too quick application air-brake	1	Unexplained	26
Misplaced switch	2		68

OTHER ACCIDENTS:	
Boiler explosion	1
Broken side rod	1
Cars burned while running	1
Too quick application of brakes	1
	4
Total number of accidents	112

A general classification shows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.	P.c.
Defects of road	0	5	0	5	5
Defects of equipment	8	15	2	25	22
Negligence in operating	13	5	2	20	18
Unforeseen obstructions	0	17	0	17	15
Unexplained	19	26	0	45	40
Total	40	68	4	112	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.
Passenger	14	23	1	38
Freight and other	52	45	3	100
Total	67	68	4	138

The casualties may be divided as follows:

	Collisions.	Derailments.	Other accidents.	Total.
KILLED:				
Employees	2	12	3	17
Passengers	0	0	0	0
Others	2	3	0	5
Total	4	15	3	22
INJURED:				
Employees	11	51	1	63
Passengers	7	9	1	17
Others	1	5	0	6
Total	19	65	2	86

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	0	0	1	5
Defects of equipment	0	0	3	1
Negligence in operating	0	9	4	11
Unforeseen obstructions and maliciousness	0	0	8	31
Unexplained	0	8	1	15
Total	0	17	17	63

Fourteen accidents caused the death of one or more persons each, and 24 caused injury but not death, leaving 74 (66 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with March of the previous five years shows:

	1894.	1893.	1892.	1891.	1890.	1889.
Collisions	40	72	75	74	67	38
Derailments	68	102	107	128	63	59
Other accidents	4	12	12	10	11	4
Total "	112	186	194	212	171	101
Employees killed	17	36	37	35	35	19
Others "	5	4	3	9	9	3
Employees injured	63	71	93	96	95	54
Others "	23	114	100	95	70	50
Passenger trains involved	38	73	68	81	49	33
Average per day:						
Accidents	3.61	6.00	6.23	6.84	5.52	3.26
Killed	0.71	1.29	1.29	1.42	1.42	0.71
Injured	2.77	5.97	6.22	6.16	5.52	3.35
Average per accident:						
Killed	0.193	0 215	0.206	0.209	0.257	0.217
Injured	0.768	0.994	0.935	0.901	1.905	1.029

For the fourth consecutive month we present a light accident record. Only 22 persons were killed, and of these five were trespassers on trains. There is no record of any passengers killed.

On the morning of March 1 there was a dense fog in New York City and Brooklyn, greatly hampering the operation of trains on the elevated railroads. There was one slight rear collision on the Brooklyn Elevated which, according to the reporters, was followed at intervals of three or four minutes by eight others. We do not learn that these did much harm to the engines or cars, and so we have not included them in the record, but the incident is mentioned as showing one of the elements of uncertainty in tabulating records of minor accidents.

Freight cars were smashed up in three different accidents in March in consequence of the sudden application of air-brakes with full force. An express train on the Canadian Pacific jumped the track near Cartier, Ont., on the 22d and four cars were overturned, the derailment being due to a broken rail. Two passengers were killed. This company has taken much pride in the fact that no passenger has ever been killed on one of its trains; and if, like the New York elevated, it confines the record to passengers inside the cars, it can still maintain the claim, as, according to the reports, the victims in this case were "shantymen," riding on the platform.

We have noted only three electric car accidents in March; at Hoboken, N. J., Marietta, Pa, and Philadelphia, Pa. Three or four persons were injured in the last two. On a mine railroad near Wilkes-Barre, Pa., on the 2d, a car filled with workmen jumped the track and fell down a bank, injuring a number of the occupants, four of them fatally.

The diminution in the number of accidents since November last has been so marked that we have compared the principal items for the first quarter of the year with the same items for the same period a year ago, and the results appear as follows:

	3 mos. 1893.	3 mos. 1891.	Decrease.	P. ct.
Collisions	260	118	142	54
Derailments	376	202	174	46
Total accidents	673	333	340	51
Persons killed	143	81	67	45
Persons injured	817	273	544	66
Earnings 128 roads (*thousands*)	$124,258	$108,372	$15,886	12¾
Earnings, per mile per year	5.188	4,412	776	15

It will be observed that the accidents have decreased in much larger proportion than the amount of business done. In the absence of statistics of train-mileage we have estimated the business by the gross earnings, as shown in the tables published by the *Financial Chronicle*, in which, however, the earnings of many important roads, where business fell off *more* than 15 per cent., do not appear. The amounts shown as earnings per mile per year are made up by multiplying the quarter's earnings by four. In general it is safe to say that with fewer trains the chance of accident is less, but whether the chances decrease as rapidly as would appear from the large differences in percentages between accidents and earnings, shown above, would be difficult to determine. No doubt the dullness, leading to the discharge of many hundreds of men, has resulted in a decided improvement of the average of ability of the force on many railroads; and besides this, the diminution of the distractions caused by over-work, extra trains, breaking in new men and other usual conditions must tend appreciably to reduce the number of blunders, whatever the qualifications of the men. The accuracy of the percentages shown is presumptively confirmed by the reduction in the averages of killed and of injured per accident, which, it will be seen, are decidedly smaller than the average of the percentages shown during the last five years. This is a fluctuating quantity, however, and must not be allowed great weight.

Electricity in Heavy Railroad Service.

We have received a copy of a paper on the conditions of use of electric motors on the present steam railroads, read by Mr. D. L. Barnes at a recent meeting of the Western Railroad Club. Awaiting the preparation of engravings for use in extended extracts from the paper we give a short synopsis of the principal points.

Mr. Barnes first discusses the question of direct current and plain motors and alternating currents and multiphase motors. He says that it is the hope of electricians that multiphase motors may become more practical than at present, for they have some advantages over the plain current motor, the principle one being simplicity of construction. But the alternating current motor is not yet developed to such a point as will permit safe conclusions as to its final adaptability to railroad work, though it is probable that it will

eventually be used for long-distance, high-speed work. For the present, however, the plain current motor is useful, but the limit of its use for railroad work is found not so much in the motor itself or kind of current as in other matters.

The electric motor is, as compared with the steam locomotive, a simple machine and the repairs must be correspondingly small. It has no valves to leak, boiler to get clogged with scale, firebox sheets to crack, grates to burn out, screw stays to break, crown sheets to come down, and so on through the list of annoyances to which the steam locomotive is subject. Therefore one great reason why electric motors may eventually take the place of steam locomotives will be found in the simplicity of construction, operation and repair.

There are yet, however, serious problems to solve. One of these is that of collecting the current from the conductor. This is solved for low speeds, but for 60 miles an hour and upward it is still in question. However, there will probably be no great difficulty in arranging this matter. Another question is that of connecting the armature and axle. For the present, electricians generally have settled down to the use of gears, although motors like that on the Liverpool Overhead have been designed in which the armature shaft is the axle of the driving wheels. Electricians are still working on the problem of getting a variable connection between a revolving armature and a driving axle.

A careful analysis is made of the efficiency of plain current motors with positive connection, but this analysis cannot be intelligibly reproduced without the diagrams. It may be said, however, that the locomotives of elevated or suburban roads are constantly putting energy into a train up to the point of application of brakes, when it is immediately taken out by the brake-shoes and wasted. It has been proposed to reconvert this energy into electricity during the process of braking by using the motors as dynamos, but no practical plan for doing this has yet been devised. It appears, however, from the investigation that for this kind of work the electric motor is best adapted to give good commercial results. The efficiency of the conducting line from the central station to the motors ought to be 90 per cent.; that of the dynamos ought to be such as to give at their terminals a current that would represent 85 per cent. of the indicated power of the steam engines, and the steam engines ought to give one horse power with 15 lbs. of steam an hour. Using the same sort of fuel on the steam locomotive as is used under the stationary boilers, and assuming it to be fair bituminous coal, each pound should evaporate into steam about 6 lbs. of water in the locomotive or 8½ in a good stationary boiler, and the steam locomotive will generate one horse power for about 25 lbs. of steam an hour when the locomotive is of the best type. On this basis, comparing the indicated power in the steam cylinders of both systems, we have 1.8 lbs. of coal per horse power per hour in the stationary engine and 4.2 lbs. of coal per horse gower per hour in the steam locomotive. But the steam locomotive uses the power directly, and there is no further loss that has to be considered in the comparison. With the electric system there is a further loss of 15 per cent. in the dynamo and connections, 10 per cent. in the line and 50 per cent. in the motors for switching, suburban and elevated railroad work, or 20 per cent. in the motors for lines having about eight minutes between stations. The final result is the delivery of about 30 per cent. of the efficiency in the cylinders of the stationary engine, at the drawbar of the motor, for switching, suburban and elevated railroad work and 61 per cent. for the longer line assumed. The result figures out, then, 4.7 lbs. of coal an hour in the stationary engine for one useful horse power delivered at the drawbar of the electric motor for short lines, which is practically the same as that required for the steam locomotive; for the longer line assumed the fuel consumption would be 3 lbs. an hour per useful horse power. This is based on ordinary fuel. With anthracite burned on large grates the locomotive will do better work in proportion, and the difference in economy of fuel will be in favor of the steam locomotive on the short lines.

In elevated railroad work, using anthracite coal and compound locomotives, we may take 3½ lbs. of coal per horse-power per hour at the drawbar. Hence, considering only the use of fuel in actual work, there would be no saving in the weight of fuel by using electricity.

The conditions vary so much that each case must be treated by itself, but for practical comparison we may assume that the same weight of fuel per ton mile would be used with the electric system as with the steam locomotives for short lines. If the conditions are such that a cheaper kind of fuel can be used at the central station than on the steam locomotive there may be a considerable saving in cost of fuel while there is none in the weight. In short, the conditions which regulate the price, control almost entirely the saving in fuel cost incident to the use of electric motors. For long runs also it appears that the average conditions are such that the same weight of fuel would be used per ton-mile, and it is only where a higher priced fuel is required for the steam locomotive than for the central station that any substantial saving in fuel cost could be made.

The first cost of central station plants and conductors for long line work is so great per mile of track that the companies must for the present hesitate to make the experiment of changing, and prices are so unsettled that it would be valuless to attempt any estimate of the cost of changing a large steam locomotive plant to an electric one; but it would not be surprising if a year hence the cost of installing an electric plant for long distance work would be half what it was a year ago. Only on short lines where the traffic is crowded is it now economical to substitute electric motors for steam locomotives.

The Organized Tramps.

During the disgraceful phase of civil cowardice which has permitted the development of Coxeyism, the railroad officers appear to have acted with commendable resolution. They have resisted the demands of the tramps for free transportation, and have generally managed to protect the property entrusted to them from misuse and damage by the irresponsible gangs who have terrorized so many communities; any exceptions to this general statement must be attributed to the exigencies which compel the railroads to conform to the local sentiment as manifested by the regular officers of the law. General Manager St. John, of the Chicago, Rock Island & Pacific, told a reporter at Des Moines that nearly all of Kelly's band were sober and intelligent men; that the army would make a profound impression and that "there was nothing to do but treat them kindly and let them go." But it appears that Mr. St. John's railroad had to pursue a stern policy, the same as the other railroads did.

The crowd which was at Cumberland, Md., a week ago, has now got within 40 miles of Washington, and the police officials of that city are preparing to resist every form of lawlessness. Reports from local points on the Baltimore & Ohio, near Washington, indicate that the number of men stealing rides, bound eastward, is very much larger than usual, from which it would appear that not all of the Coxeyites march in the ranks. The towns in Pennsylvania and Maryland have usually followed the regular fashion, heretofore manifested everywhere, of temporizing with the vagrants in any way that seemed most likely to crowd them along to the next town; but at Ellicott City, Md., the officials warned the army to get out of town at once on pain of being set to work for the county.

The crowd led by Frye was near Brazil, Ind., at last accounts. The state authorities compelled the men to be vaccinated, which must have given them unpleasant notions of the paternalism of our government. On Tuesday night last 300 of these men seized a freight train on the Vandalia Road near Terre Haute, but the conductor set back into the freight yard and outwitted the tramps.

Kelly's "army" was in Walnut, Ia., on April 24, with 23 companies said to contain 953 men. This is the crowd that came from California and it has given more material to the reporters during the past week than any of the others, internal dissensions having caused numerous disturbances. At Council Bluffs on Friday last, a crowd of Omaha "workingmen" to the number of 5,000 seized a Union Pacific engine and 11 freight cars and ran the train to Weston, Ia., for the purpose of handing it over to Kelly's army, but Kelly refused to accept it, saying that he would not violate the law, and the scheme of the mob came to nothing. It appears that the presence of the army was so threatening that trains were entirely suspended on the Chicago, Rock Island & Pacific, the Chicago & Northwestern and the Chicago Milwaukee & St. Paul, on the divisions terminating in Council Bluffs, for four days, and the officers of one company had the track torn up near Weston in order to prevent the lawless movement of trains.

At Barr, Col., near Denver, on the 18th, a large band of Coxeyites were left without shelter by the action of the Burlington & Missouri River road in getting sheriffs to keep them off the company's freight trains. At Colton, Cal., the commander of the "unemployed" was arrested for evading railroad fare on the Southern Pacific. About 600 men have been banded together at Portland, Or., to go to Washington, but they apparently do not intend to start unless they can ride. Over 900 men are enrolled at Seattle, Wash., and considerable numbers are reported as gathered at other points in that state. A press dispatch from Cheyenne last week reported 80 of Kelly's men as arriving there packed in a single refrigerator car. Whether or not the car had been regularly iced on the road was not stated.

The most outrageous interference with a railroad that has yet been reported (aside from that at Omaha) was that at Butte, Mont. on Monday night last, when about 400 men seized an engine and some freight cars in the Northern Pacific yard and started eastward on their own hook. The crowd had been trying for four days to get help from the municipal authorities and finally bulldozed them so that the departure of the mob from Butte was not opposed by the local officers of the law. According to press dispatches the train stopped for breakfast at Bozeman, Mont. At Timber Line, Mont., a landslide was encountered, but the earth was shovelled away and the train reached Livingston at 5 o'clock Tuesday afternoon. It was finally recaptured by a United States Marshal at Columbus, Mont., over 100 miles from Butte.

A correspondent of the *Railroad Gazette* familiar with the doings at Omaha, characterizes them as outrageous in the extreme and says that the reports telegraphed abroad have been too tame. The "army" arrived in Omaha Sunday the 15th; the police tried to make them "move on" and on Monday they started, the Governor of Iowa sending four companies of militia to watch them. But the railroads refused the demands of Kelly and of city officials and the army had to camp out in the rain. This aroused the demagogues, and the clamor against the railroads was furious. The mob that went from Omaha to Council Bluffs on Friday numbered 10,000 and it was led by a notorious saloon-keeper. The newspapers added fuel to the flames, and men not in sympathy with the mob were made to "shut up." No trains ran into Council Bluffs over the Northwestern, the St. Paul or the Rock Island for four days and wholesale merchants were wild with anger. "The cause of all this tumult was the frenzy of the labor-unionists, led by demagogues and an inflammatory press."

There is not a superintendent of motive power or a master mechanic in the country who does not wish members of his engine crews to keep away from saloons and similar resorts, yet few such officers make much effort to keep the men away from such places, further than to discipline them after something happens. The peculiar situation of members of engine crews—and the same is true of train crews—requires them to spend about half their leisure away from home and its restraining influences. Their pay will not allow them, nor would it be possible if the pay did allow, to maintain a home at both ends of a division; and assuming that men who did have two homes would live in the same fashion that was in vogue when Dickens wrote on the subject 30 years ago, it is undesirable that they should. On divisions having one terminal in a large city the men generally select, for economical reasons, the smaller town for their home and often do not maintain even a sleeping place in the city. With such men the time in the city must be spent in places where they are welcomed, and it is not surprising that many of them find their way to saloons, at first to kill time and later from force of habit. Reading-rooms have been established by railroads, but not always in the larger towns, and not all men care to visit such places in their working clothes. Again, they cannot doze in the reading-rooms, and engine crews like a nap when they can get it. It is a first-rate plan for railroad companies to provide plain, clean and free sleeping places convenient to the roundhouses. Such places keep many of the men from the saloons, the men get more sound sleep, of which they are too apt to rob themselves, and in every way the service is enough better to give excellent returns for the small investment. Some of the roads do provide such quarters for their engine crews, among the number being the Pittsburgh, Cincinnati, Chicago & St. Louis. The arrangement at the Chicago roundhouse of this road is cheap, but neat and clean, and answers the purpose well. An old passenger car was placed at one side of the house, and fitted up with a stove and bunks, the latter being provided with mattresses and blankets. A crew coming off the road and with a few hours to spend at the Chicago end of the division, goes to the bunk car for rest. On the register, opposite the number of the bunk selected the name of the one to occupy it and the time he is to be called are written. By this arrangement the caller is saved many hours of search for crews, and this saving alone largely offsets the cost of maintaining the sleeping place. Such accommodations are probably most urgently needed in large cities, but the same accommodations at every division point would result in great good to both men and companies.

The strike on the Great Northern is still unsettled, as we go to press, and it seems to be quite a serious affair, though the press dispatches continue to be fragmentary and indefinite, so that it is impossible to estimate with accuracy the extent to which business is disturbed. On Tuesday it was reported that negotiations looking to arbitration of the questions at issue between the railroad and its employees had fallen through, the leaders of the American Railway Union refusing the proposition of President Hill to submit the whole matter to three arbitrators on condition that the men at once resume work. The strike has extended throughout the lines of the company to the Pacific Coast, and appears to have put a stop to all freight traffic. West of Minnesota, passenger trains appear to have been suspended for nearly, or quite, a week; but on April 18 an injunction against interference with trains was issued by Judge Sanborn of the United States Court of Appeals at St. Paul and was served on the leaders of the strikers at a number of division points, and since then mail trains have resumed their trips with some show of regularity. The United States Marshal swore in a large number of deputies and arrested prominent strikers at several points in Minnesota. Many of the men arrested were brought to St. Paul and put in jail. The usual lawlessness such as uncoupling trains and intimidating men at work was reported from many places. The sheriffs were called upon and Governor Nelson, of Minnesota, sent out orders to one or more sheriffs, with the view, apparently, of stiffening their courage. On Sunday a St. Paul dispatch reported that for the first time there were no riotous demonstrations at any point along the line. On Monday Lawrence

Maxwell, Acting Attorney General of the United States, sent to Railway Mail Superintendent Neilson, who is at St. Paul, an opinion that a mail train includes its passenger cars. This is one more piece of "oppression" which the strikers will doubtless resent with great warmth.

In the *Engineering Magazine* for April appears an article by Mr. Courtenay DeKalb, describing the railroads of South America, with epecial reference to their geography, traffic and financial results. The article covers the subject pretty thoroughly, but of course a detailed description of any one railroad could not be expected in a magazine article of 10 pages, nor is it within the scope of such an article. Mr. DeKalb takes up the various groups of railroads in the different countries and tells us what is the capitalization and what are the earnings of each group, and gives us some notion of the conditions which control in each country, explaining why the railroads of that country have or have not been profitable. It appears that in Brazil out of a total of 6,000 miles, not more than 1,700 miles of railroad are earning operating expenses, and this may be attributed in general terms to the fact that a government guaranty has caused the illogical location of the lines. The Government has already paid more than $80,000,000 in such guaranties, and pays yearly about $9,000,000. In Chili out of 1,846 miles of railroad the Government owns and operates 686. The operating expenses of the Government railroads consume 82 per cent. of the gross receipts, and a project is on foot for leasing the government railroads to private corporations. As a rule, these railroads have been costly and the traffic fluctuating. Mr. DeKalb concludes from the South American examples that the railroads having a government guaranty do not pay as well as private, unguaranteed lines, and that government interference is an evil so far as the railroads themselves are concerned and so far as the people whom the railroads serve are concerned. A serious disadvantage, which would be felt as the present railroad systems are closed up to connect with each other, is the great diversity of gage, which runs from 2 ft. 11½ in. up to 5 ft. 6 in. In the Argentine alone there are five different gages and in Brazil six. The connection from the Argentine through Bolivia to Peru would be made by the Northern Central one meter, the Antofagasta & Bolivia 30 in., and the Southern of Peru 4 ft. 8½ in.

The Illinois Central proposes to make some changes in its method of handling suburban passengers at Chicago, which will probably facilitate traffic considerably. The changes contemplated provide for the elevation of station platforms to the level of the car floors, the removal of car steps and the use of platforms and safety gates similar to those in general use on elevated roads. It is also proposed to do away with ticket collectors on trains and replace them with ticket receivers at each station. This latter idea will, however, bring up the problem of equalizing fares and may prove troublesome. The fares now vary from 5 to 12½ cents. It is not likely that the short distance patrons will take kindly to an increase in their fare in order that the railroad company may reduce the fare to those making longer trips, nor is it probable that the railroad company will feel that it can haul a passenger 18¾ miles for five cents. The other changes mentioned will be begun very soon, and it is expected that the platforms will all be elevated and the cars remodeled within two or three months. The experience of the Illinois Central, during the World's Fair, with its fast express service has convinced its officers that the elevation of station platforms, even without the use of side doors, will be advantageous, though it is proposed that cars hereafter built shall be made with side doors and compartments, and the idea is receiving serious consideration. With three compartments and three exits on each side of a car the time required to load or unload a train will be greatly reduced, but whether the move will be a popular one may be questioned. Some of the patrons of the Chicago & Northwestern have lately been complaining because of the fact that on six-car suburban trains the doors between the third and fourth cars are locked in order that the two collectors might work the train more thoroughly and with less annoyance from those who claim that "the other conductor got my ticket."

A strike of bituminous coal miners of widespread extent began on April 21, the object of the strike being to secure a uniform rate of wages in all the districts mining bituminous coal. The strike was ordered two weeks ago by a National Convention of the United Mine Workers, which has a good organization in most of the states mining soft coal. The order to strike seems to have caused a pretty complete suspension of bituminous coal mining, except in a few districts where the miners are working under special contracts, which expire on May 1. In some districts the miners have stopped work, without regard to their contracts with the operators. The reports which have been published give news obtained from the labor leaders and are very incomplete and too unsatisfactory to enable any careful statement to be made at present, as to the number of miners who have quit work. President McBride, of the miners' union, estimates that over 126,000 miners are out, and gives the following figures: Alabama, 8,000; Tennessee and Kentucky, 5,000; West Virginia, 2,000; Indiana, 5,000; Ohio, 26,000; Illinois, 27,600; Pennsylvania, 50,000; Indian Territorry, 2,000; Michigan, 3,000; Iowa, 1,300. The strike seems to have been successful in calling out practically all the miners in Ohio and in Western Pennsylvania, where 20,000 are reported to have stopped work. In Illinois and West Virginia many miners refused to obey the order. The coal traffic of the railroads has undoubtedly been interrupted, but, as intimated, it is impossible at present to say how seriously.

The Interstate Commerce Commission has issued an interesting decision on a question of freight classification, which is briefly reported in our traffic columns. The question was whether window shades on rollers, the wood constituting about half of the weight, should be reduced from first to third class, because hollands (the shades, uncut, without the sticks), weighing twice as much per cubic foot, was carried at third class; and the decision is in favor of the shipper. It seems to be based, practically, on the ground that as the railroads vary classifications in any way it may seem to them best, at the time, for the purpose of influencing traffic, and that they had done some questionable acts in this particular case, it would be no more than right for them to level *down*, and not level up, in this case. By most railroad officers this case would be regarded as one of those which has to be settled by rule-of-thumb, according to the exigencies of each particular case, and they would not regard it as "interesting" unless they were compelled to act as arbitrators upon it; but we have used that term advisedly, nevertheless. The report is interesting because it furnishes to the lay reader a detailed account of the ins and outs of ratemaking such as he seldom sees. Commissioner Veazey has investigated almost every conceivable question in the premises, and the report fills a dozen pages. It shows him to be a careful investigator and a discriminating judge; but whether the Government Printing Office is warranted in expending its energies in this way may be doubted.

The New England Summer Resort Association, the proposed establishment of which has been heretofore noted in these columns, has got so far that a committee has formed a legal organization, under the laws of Massachusetts, and it has been decided to open an office in New York City. This organization has been formed for the purpose of more effectively advertising New England as a summer resort, especially that part of it north and east of Boston. The principal enterprise of the association will be the New York office, which is to contain a scenery exhibit and an information bureau, as well as a supply of railroad tickets. The Boston & Maine Railroad seems to be the prime mover, and General Passenger Agent Flanders, of that road, is the President of the Association. The only road south or west of Boston appearing in the Committee on Organization is the New York, New Haven & Hartford. Two prominent hotel-keepers are on the Committee, and the co-operation of that interest is evidently to be an important element in the Association. It is proposed that hotels and boarding-houses shall contribute to the support of the Association $10 a year each and an additional sum based on the capacity for guests, $2.50 a year for each additional five guests above 20.

The convention of the air-brake men at Columbus, O., seems to have been a great success, everyone present pronouncing the papers and the discussion upon them exceedingly interesting. This organization was formed only a year ago and its membership has now increased from 16 to 98, and this body consists entirely of men who have a practical interest in the technical questions that come before the association. We print on other pages some of the papers read at this meeting, and expect to give the others in the near future. The list of subjects discussed and the names of the men appointed to prepare papers upon them were published in the *Railroad Gazette* of Feb. 16.

The Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific companies have given notice that they cannot accept the Chicago track elevation ordinance in its present form. The main difficulty seems to be in the matter of damages north of Twenty-second street, which, by the terms of the ordinance, the railroad companies were to assume. This was objected to on the ground that in suits against railroad companies, damages are pretty sure to be excessive. It is understood that the roads interested offered to pay to the city a reasonable sum on condition that it assume all damages.

NEW PUBLICATIONS.

The Book of the Fair. By Hubert H. Bancroft. Chicago: The Bancroft Co. 1894. Imperial folio, 12 × 16 in.

This publication aims to give a popular account of the World's Fair at Chicago, describing not only the buildings and their architectural features, but the organization of the various departments and the most important and striking exhibits. It is probably the most ambitious attempt ever undertaken by private enterprise to describe a great international exhibition. It is to be issued in 25 parts of 40 pages each, and it is promised that the work when completed will contain over 2,000 illustrations. Each part is finely printed on heavy enameled paper, and the illustrations are beautiful examples of half-tone work. The plan was well conceived and has been carried out so far with judgment and skill. The first chapters are given up to a history of previous international exhibitions, a description of Jackson Park, and the organization of the fair. Chapter 12 is devoted to an account of the Palace of Mechanic Arts, and of the machinery exhibits. The illustrations are very effective and give full-page pictures of the great Allis-Corliss engine, the Edison engine and dynamo, and smaller pictures of the Westinghouse engines, the model machine shop, woodworking, cotton, and pumping machinery, looms, etc. This chapter takes up nearly 40 pages.

The description of the Transportati on Department begins in Part 14 and is to be continued in Part 15, not yet issued. The text of this chapter, the eighteenth, is a good popular summary of the railroad exhibits. The illustrations include the Stourbridge Lion, and many of the locomotives exhibited in the Baltimore & Ohio collection, 11 photographs of the Pullman and Wagner trains, which reproduce faithfully the beautiful decoration of those cars and many others of interest.

Mountain Cable Roads.—A work on the mountain cable railroads of Switzerland has been prepared by A. Walloth, an officer of the Prussian State Railroads, containing detailed descriptions of no less than 19 such railroads, with a portfolio of 10 lithographic plates. The material was collected under a commission from the government of Alsace-Lorraine, and is intended for practical use of engineers having similar roads to build.

TRADE CATALOGUES.

The "W. & S." Hydraulic Machinery Works, 204 E. 43d street, New York City, have issued a new 5½ × 8 in. catalogue, 37 pages, with many illustrations. It is the same size and style as the others published by the Watson & Stillman Works, and is given almost entirely to the subject of hydraulic jacks, of which there are 20 varieties and sizes. Several special types are built expressly for railroad service, among them a "wrecking" pattern, two types for journal boxes, one for crank pins, one for pulling and hoisting, and several types of screw jacks for lifting and traversing. The book contains illustrations and sections showing the construction and operation of the jacks.

This catalogue is accompanied by another one showing and describing the hydraulic machines manufactured by the works. These include hydraulic punches, shears and benders for rails, plates and structural iron, all of convenient portable design for field service. The punch for 90-lb. rails, which gives a hydraulic pressure of 120 tons, weighs only 300 lbs.; and the rail bender for 90-lb. rails weighs 275 lbs. Cuts and prices of 15 different punches are given, among them special shapes for the web of the Johnson street girder, for the web of the cable-slot rail, for base of the same and for spike slots of "T" rails. Numerous shears are also shown for round bar and plate iron, wire rope and structural shapes. Most of these tools are for hand power, but the company also manufacture heavier machine tools to be operated by power.

Hydraulic Machinery.—The General Manufacturing Co., Havemeyer Building, New York.

This is a new catalogue issued by a company organized for the purpose of manufacturing hydraulic machinery under the patents and superintendence of Ernest W. Naylor, M. E., whose high pressure hydraulic pumping engine we illustrated and described in a late issue. The company's works are to be at Bound Brook, N. J., where they propose to manufacture simple, compound and triple expansion hydraulic engines, accumulators, forging and flanging process, shears, punches, riveters, cranes aad motors, and in short build hydraulic plants for boiler manufacturers, bridge builders, forgers, founders, etc. The catalogue contains illustrations of these tools and machines including multiple punching machines, hydraulic cranes and elevators with descriptions and dimensions of the same. The officers of the new company are Abner W. Pollard, President; Robert S. O'Loughlin, Vice-President; Louis A. Pollard, Treasurer; Edward G. Kidder, Secretary, and J. B. Cleaver, Manager.

The Lodge & Shipley Machine Tool Company, of Cincinnati, Ohio, is sending out a small catalogue illustrating its tools and machines, which include horizontal boring machines, pulley lathes 30 to 60 inches, drilling and tapping machines, turret lathes 12 to 37 inches, a triple facing machine and a universal brass worker. These machines and tools are specially adapted to such work as the details of slide valves for Corliss engines, pumps, cotton and printing presses, sugar machinery, couplings, pulleys, etc. which may require checking and more than one operation of turning and boring. Engravings are given of many tools and machines made by the company, together with explanations of their purposes, their sizes, weights and specifications.

Light Cars.—Messrs. Fairbanks, Morse & Co., of Chicago, Ill., issue under their own cover a catalogue

of the light cars of various sorts made by the Sheffield Co., of Three Rivers, Mich., the product of which firm Fairbanks, Morse & Co. sell, but of course not exclusively or in any particular territory. It is hardly necessary to say that the catalogue shows a great variety of light cars, including velocipede cars, an odometer car with a counting attachment for measuring distances traveled, tmine car, sectionmen's cars of various sorts, a weed-cutting car, dump cars and coke buggies and station trucks in considerable variety. The Sheffield automatic standpipe is also shown.

The Erection and Use of Baker Car Heaters. William C. Baker, 143 Liberty street, New York City.

Under date of March, 1894, Mr. Baker issues a revised edition of his pamphlet descriptive of the arrangement and care of the Baker heater, and he tells us that this book is revised only when new inventions and improvements require that it should be done. The pamphlet is divided into four sections, namely, how to erect, how to run, how to repair the Baker heater, and finally "good advice." The Baker heater is too well known to need any description or introduction, and Mr. Baker has prepared in this little pamphlet of 42 pages a very careful manual of the heater which is provided with an alphabetical index to further increase its usefulness.

Price List and Telegram Code of Wood-Workers' Machinery Supplies. J. A. Fay & Co., Cincinnati, O.

Messrs. J. A. Fay & Co. have issued in a compact little pamphlet a complete revised price list and telegraph code of wood-working machinery supplies, shafting, hangers, pulleys, etc. A very full and complete code is given by which articles of any description and price can be ordered by one or at most two code words, and the pamphlet covers a great variety of material. Special codes of amounts, prices, terms, etc., are added.

Dayton Railway Crossing Gate.—The Craig-Reynolds Foundry Co., Dayton, O., issues a catalogue illustrating the Dayton gate, and describing its construction and method of operation. The Dayton gate is positive in its mechanism, the operating connection being a direct mechanical one from the hand wheel to the gate.

Railroad Matters in Chicago.

Freight Traffic.—The flour and grain traffic is scarcely up to anticipations. The aggregate deliveries here the past week by 10 leading roads were 90,281 barrels of flour and 2,294,000 bushels of grain, against 82,306 barrels of flour and 3,430,000 bushels of grain the same week in 1893, and 82,654 barrels of flour and 3,000,000 bushels of grain in 1892. In other classes of farm products the past week showed a material increase over the same time a year ago. There was also a gain in the deliveries of live stock, the aggregate by the lines mentioned being 66,091 head of cattle, 145,4.0 hogs, and 66,100 sheep, against 53,176 cattle, 103,435 hogs and 61,693 sheep the same week in 1893. The outbound merchandise freight to the interior was larger than anticipated. The volume of high-grade miscellaneous package traffic being about equal to a year ago. There was also a liberal movement of agricultural and other heavy machinery, iron and iron goods, but a loss on a number of lines of low-grade freight, including structural materials. Advices from many parts of the interior, while reporting the movement of freight between leading points as fair, state that it is less liberal than 12 months since, and the decrease in the freight earnings of some of the large lines is mainly due to the decline in interior traffic. The loss at some points is attributable to a partial or total suspension of industrial operations because of strikes, and the recent promise of a fair activity in manufacturing and other pursuits during the coming six months is rapidly disappearing. As the railroads are largely dependent for support from such industries the managers are the reverse of encouraged at the outlook. This is especially the case with the lines which traverse the principal coalfields of Indiana, Illinois and Iowa, where the miners have either declared or threaten strikes at important mines.

Interviews with the leading dealers here fail to discover any especial cause for uneasiness regarding the strikes. They state that the supply of coal here and at other points is ample to fill the industrial, railroad and domestic wants for many weeks, and predict that the miners will soon see their folly and be glad to return to work before some of the leading mines care to receive them, the mineowners stating that they have for months kept their mines open more for the purpose of furnishing work to employees than the profit on the coal marketed, the latter being altogether too small to discover. This latter statement is well supported by the known depression in the coal market here and at other leading points.

	1894.	1893.	1892.
C. & N. West	418,000	512,000	330,000
Ill. Cent.	182,000	375,000	377,000
C., R. I. & P.	331,000	38,000	377,000
C., B. & Quincy	400,000	1,338,000	778,000
C. & Alton	149,000	75,000	269,000
C. & E. Ill.	32,000	62,000	52,000
C., M. & St. P.	432,000	404,000	453,000
Wabash	127,000	56,000	85,000
C. & G. W.	84,000	171,000	124,000
A., T. & S. Fe	123,000	196,000	155,000
L., N. A. & C.	16,000	3,000	.....
Totals	2,294,000	3,430,000	3,000,000

The table just preceding shows the deliveries of grain (bushels) received at Chicago by the leading Western railroads for the week ending April 21, and comparisons with the two preceding years.

The deliveries of flour (barrels) at Chicago by the leading Western railroads for the week ending April 21 and the corresponding time the two preceding years compare as follows:

	1891.	1893.	1892.
C. & N. W.	16,470	22,429	26,992
Ill. Cent.	300	1,050	1,065
C., R. I. & P.	9,827	1,650	5,375
C., B. & Q.	11,797	18,404	9,818
C. & Alton	4,800	1,097	4,200
C. & E. Ill.	600	450	125
C., M. & St. P.	24,075	26,400	19,775
Wabash	.....	925	1,036
C. & G. W.	22,412	9,301	14,121
A., T. & S. Fe	.....	450	147
L., N. A. & C.	.....	150	.....
Totals	90,281	82,306	82,654

Passenger Traffic.—Passenger officials are predicting a very moderate business as summer approaches, and say that strict economy in train service will be necessary to enable them to make a respectable showing of earnings from this until autumn. The sentiment in favor of continued economy in the operation of all departments is also pronounced, and the returns of some of the big lines for March show that the managers have not been talking for mere effect, the report of the Chicago, Milwaukee & St. Paul being a decided surprise to outsiders.

CHICAGO, April 23.

How to Instruct Trainmen and Inspectors About Air-Brakes.*

Great care must be exercised by the instructor to give in the first lesson *only* the most general ideas of the system. The mistake most frequently made is to bring in too much detail. A man cannot be expected to understand the beauties of excess pressure until he knows that the stored pressure in the main reservoir is the force that is utilized in releasing the brakes. Nor can any one be expected to comprehend the action of the graduating valve in the triple until he knows and clearly understands the general functions of the triple.

Engineers.—The enginemen, if anything gets out of order, should be able to report it intelligently, as any defect intelligently reported is as good as half repaired already. Engineers should have instruction in regard to the engineer's valve, the uses of the gage and pump governor, and be held responsible for the adjustment of the latter and the care of the air pump; necessity for draining the main reservoir and cleaning the pressure-reducing valve of the signaling apparatus should be thoroughly understood. . . . The misuse of the emergency application, especially at water tanks, and the failure to release brakes at the proper time, to avoid the disagreeable shock to passengers, should be explained and overcome. The necessity for carrying the excess pressure that brakes may be promptly released, and thus decrease the tendency for brakes to stick and slide wheels, and how to carry excess with leaky trains should be understood. Carelessness in releasing at the wrong time, using the emergency application when it is not needed and giving the air cylinder of the pump too much oil are the most objectionable practices to which engineers are addicted, and should be emphasized accordingly. . . .

Trainmen.—Trainmen should have a thorough knowledge of the construction and operation of the triple valve, aside from a general understanding of the air-brake, that they may become skilled in locating any disorder or defect, and be able to judge whether the trouble is sufficient to warrant that brake being cut out, or what repair is necessary to be made that it may be cut in. Brakes are frequently cut out for trifling reasons. When the defect-card system is generally introduced it will be necessary for trainmen to intelligently report defective brakes, and a thorough knowledge of the triple valve will be required to do this. Making up and testing air-brake trains should be understood by trainmen; also troubles in setting out and picking up cars. The importance of proper and uniform piston travel, the causes for wheels skidding and brakes sticking, should be impressed upon them. After they have mastered their own duties they should be permitted to attend engineers' classes, and should not be refused further advancement in any direction desired. They should also be instructed in the proper method of using the air signaling apparatus, that they may be able to give true signals to the engineer.

Machinists.—Where practicable, special men should be assigned to air-brake repair work, for such work will be found to be of better quality and less expensive than in cases where any and all men do this work.

Car Inspectors.—The car inspector should have a thorough knowledge of the triple valve, the quickest and best way of cleaning and oiling triples and brake cylinders; he should observe that the screens or strainers are clean and in place; that the quick-action feature of the triple is not blocked or destroyed by a removal of some of the parts, and should it be found to be in this condition, the parts to operate it should be replaced. The pressure retaining valve and pipe should be inspected and left in serviceable condition. He should see that all air hose and coupling gaskets are in place and in good order. Piston travel is the most important thing he should be taught, and be instructed in the effect of varying piston travel on trains, and how a train will pull and surge when pistons do not travel uniformly. He should be taught that the mere oiling of the brake cylinder through the oiling place will not keep the leather packing in first-class condition, as such oiling only lubricates the bottom of the cylinder and the leather packing which touches that particular part, and does not reach the top of the cylinder and the leather coming in contact with it. Each time oil is given the cylinder through the oiling place, the piston should be rolled half way round, thus bringing the dry part to the bottom of the cylinder and placing the lubricating part on top. In order that the leather packing may be kept soft and in perfect condition, it is necessary that the cylinder head be taken off and the piston and its attachments removed, and the cylinder thoroughly cleaned and oiled about twice a year. This is necessary to insure good holding brakes.

Instruction necessary to secure an efficient air brake service is not finished when the employees coming directly in contact with brakes have been instructed, but it should be extended to officials whose support is desired in maintaining and repairing brakes. Considerable judgment will be necessary to accomplish this, but a good instructor can do it and will be rewarded by the support he is sure to obtain if he uses tact and delicacy.

Methods.—The middle course, based on an understanding of the fundamental principles of the air-brake, whereby each action suggests the reason therefor, and brings a man to a closer relationship with his duties, is the best. A good air-brake instructor is the one who disseminates the most information, and in a manner readily assimilated by his men, and not he who poses as a monument of wisdom. A good instructor will never withhold any information from his men, nor attempt to tangle them with intricacies beyond their comprehension, but will at all times willingly give any desired information, devoid of the selfishness of the man who is careful that no one shall know as much as he. An instructor should ride on engines frequently and be able to make good stops himself.

An instruction car is a necessary adjunct to thorough instruction, and should be fitted with air pump, governor, main reservoir, brake valve, etc., and other apparatus necessary to put into practical operation as many brakes as are sufficient to show their operation on a long train. With instruction cars not having brakes sufficient to represent a long train, much valuable information is lost. Gages should be plentifully used; also sectional models of all valves in the air-brake system. Both plain and quick-action triples should be used. Brake cylinders with stirrups for blocking up, to show the pressures at different piston travels, should be had, and will be found to be valuable in establishing the importance of piston travel on trains. It is questionable whether it would be advisable to use so much valuable room as a four-wheel truck would occupy in order to show the effect of piston travel, when the same can be done with a cylinder and stirrup, especially as further instruction in this line may be carried on to good advantage under an ordinary car outside. This precludes the possibility of complaint so frequently made, that conditions are not the same as under a car in service. It is not only necessary to have a piston travel device to show the pressures at different strokes, but at least two of these should be had to show the effects of variation in travel when working together with cars having longer or shorter travel. A sectional triple valve, connected and working in conjunction with a live triple, by which may be seen all the movements and positions, from the charging of the auxiliary reservoir, through the service and emergency applications, to the release of the brake, is the most valuable piece of instructive apparatus that can be used in the instruction plant, and will convey an understanding of the triple valve more satisfactorily than anything else can.

Classes should not exceed eight or ten men in number, as any greater number will require some to be so far away from the instructor that they cannot see and hear to good advantage. Those who have been previously instructed should give preference to new-comers, and allow them the advantage of being as close to the instructor as possible. The necessity for following up instruction with an examination cannot be too much emphasized. Instructors who omit this most important part are not working their instruction plant to more than one third of its capacity, and have no means of knowing how much is being learned. The examination brings out that which is not thoroughly and correctly understood. Without it the most important things are neglected. Some instructors believe it better to examine each man singly, and rate him according to the number of questions answered correctly, while others believe in examining in classes or collectively, and rating according to the knowledge the man has at the time the examination is finished. In either instance the man's ability to do good road work should be taken into account when rating him. The committee is about equally divided upon these two methods of examination. If the man is embarrassed it is best to assist him instead of plying him with puzzling questions. Patience and consideration are two prime requisites which a successful instructor must possess. Puzzling questions should be given only to advanced classes, and facetious fellows who insist upon monopolizing the whole of the instructor's time. A man who knows the answer to a question will invariably make an attempt to give it, and will never make the excuse that he knows but cannot express himself. This fact will be proved if the question be formed so that it can be answered by yes or no. Care should be taken not to tire or burden the pupil with uninteresting and detailed information. Make the instruction as interesting as possible, and make him feel that he is learning. Memorized and monotonous sing-song instructions should be avoided. The successful instructor must work as hard as his pupils; otherwise he makes himself languidly uninteresting, and he, not his class, is to blame for the lack of interest manifested. Nightwork, as a rule, is unsatisfactory and unprofitable.

What To Tell.—The first thing to fix in the pupil's mind is the place where the pressure is stored for supplying the brake cylinder. This may be done by making a comparison between the straight and automatic brake systems, dwelling on the fact that the straight air system required but one reservoir, and that was the main reservoir on the engine, which carried the supply for all of the brake cylinders, but the automatic brake has an auxiliary reservoir placed under each car, in which pressure is stored for the individual use of that brake cylinder, independent of all others, and will supply pressure to its cylinder upon any reduction made in the train pipe, regardless of whom or what it is reduced, and the number of pieces into which the train may be broken. The main reservoir pressure, in the automatic system, is reserved to release and recharge auxiliary reservoirs. This may be proved to the satisfaction of the pupil by having him watch the red hand when application of the brake is made. It will be found effective to say that the train pipe pressure holds the brake off. After the pressures have been explained, the triple valve should be next taken up. It would be preferable, on account of the confusion it will occasion, to make no reference to the quick-action triple until after the plain triple is thoroughly understood. In

* A paper read by Mr. F. M. Nellis before the Air-Brake Men's Association at its first annual meeting, Columbus, O., April 13. The committee appointed to prepare this paper consisted of F. M. Nellis, Paul Synnestvedt, T. H. Hedendahl, F. H. Cota and H. B. Shreve.

speaking of the triple, merely mention the piston and slide valve, and say that all pressure going to the brake cylinder must come from the auxiliary reservoir. Then, later on, when the pupil understands the operation of the piston and slide valve, the emergency feature may be taken up, and will be more easily understood than if it were all given together to him. Before taking up the triple valve in a general way, it is advisable to first explain that it consists of a piston and slide valve, which perform three duties—that of charging the auxiliary reservoir with pressure with which to apply the brakes, moving the slide valve in position which connects the auxiliary reservoir to the brake cylinder, which applies the brakes, and returns it to its normal position, connecting the brake cylinder with the atmosphere and allowing the brake to release. Explain that the slide valve in admitting and exhausting air to and from the brake cylinder, performs the same duty for its own cylinder, but instead of an eccentric being used to furnish movement to it to cover and uncover ports, a piston is used which shifts by differential pressure, and gives movement to the slide valve. The duty of the slide valve is to make and break connections, and the piston gives it movement to do this. This piston, in turn, receives its movement from the two pressures—the auxiliary reservoir pressure on the slide valve side, and the train pipe pressure on the plain side. As long as these two pressures are equal there is no movement from the piston, but if the train-pipe pressure is reduced below that remaining in the auxiliary reservoir, undisturbed, the latter pressure, stronger, will force the piston downward, carrying the slide valve with it, and thus communication is made between the auxiliary reservoir and the brake cylinder which allows pressure to flow from the former to the latter, applying the brake. To release the brake, the main reservoir pressure, which has been cut off during the application, is allowed to flow to the train pipe, which increases the pressure therein, above that remaining in the auxiliary reservoir, and causes the piston to return to its normal position, carrying the slide valve with it, which breaks the communication between the auxiliary reservoir and brake cylinder, and makes one between the brake cylinder and open air through which the pressure escapes to the atmosphere, and the brake is released. The normal position allows the auxiliary reservoir to recharge at the same time the brake is releasing.

It pays to dwell upon this part of the triple until each and every man understands it. This, of course, refers to the examination of the pupil, as there is no way while giving the instructions to know just how much of it he has taken in, but the instructor should make it plain and as simple as possible as he goes over it.

After this first part is understood the graduating feature may next be taken up, and will come quite easy to the pupil. Follow this up with the emergency feature of the quick-action triple. Explain first that the emergency feature is merely an addition to the plain triple, and is never called into action except by a sudden reduction of pressure in the train pipe, and lies dormant during a service application. The quick action and plain triple will work together in harmony so long as the pressure is reduced gradually in the train pipe, by which operation the pistons and slide valves of both triples travel but half stroke in their cylinders, and openings are made by the slide valves for the auxiliary reservoir pressure to pass to the brake cylinders of both cars. But a sudden reduction of pressure in the train pipe will cause the pistons of both triples to travel full stroke, whereby the plain triple admits auxiliary reservoir pressure more suddenly than before to the brake cylinder, but no higher pressure is obtained than with a slow or service application. The further traverse of the piston in the quick-action triple, however, opens up an extra set of ports not used before, bringing into action the emergency feature, which takes a portion of the train-pipe pressure to the brake cylinder, which is increased by the pressure coming in later from the auxiliary reservoir. In the emergency application, therefore, the quick-action triple, using both train-pipe and auxiliary reservoir pressures, gives a higher pressure to the brake cylinder and a quicker application than the plain triple. It is not the amount of pressure drawn from the train pipe which causes quick action, but the manner in which it is drawn. A slow, heavy reduction will have no other effect on the quick-action triple than to cause it to admit auxiliary reservoir pressure to the brake cylinder, while a sudden, though smaller, reduction will produce quick action. In the service application of the brake, on a train of cars equipped with quick-action triples, the discharge of air made at the engineer's brake valve reduces the pressure throughout the entire length of train pipe, but, in the emergency application at the engineer's brake valve, merely causes the first brake to apply, and, in drawing the pressure from the train pipe to the brake cylinder, makes a reduction for the second car, the second making a reduction for the third, and so on throughout the whole number of cars. The triple valve in this case is not only a triple valve, but inasmuch as it makes a reduction in the train pipe it is a brake valve, also, for the succeeding car. The quick action feature of the triple may be compared to a package of firecrackers—touch off one, and the whole pack will go. This will be a good place to tell why the quick-action feature is necessary; that an emergency application on a long train equipped with plain triples is not sufficiently quick to prevent the rear cars from running into the forward ones with destructive force. Also that it gives a safety limit for braking in the service application, without sliding wheels, but gives additional braking in emergencies, when it is desired to stop quickly to avoid accident, which may result in loss of life and property.

The practice of removing parts to nullify the quick-action feature should be combated, and all repairmen instructed to supply the parts to restore the quick-action feature. Before leaving the triple valve, summarize as follows: The auxiliary reservoir carries a storage of pressure, requiring recharging after applications, for the use of the brake cylinder. The triple valve performs three functions, from which it receives its name, viz.: charges the auxiliary reservoir, applies the brake, and releases. The slide valve makes and breaks the communication between the auxiliary reservoir and the brake cylinder. The piston gives movement, by means of the differential pressures, to the slide valve to enable it to do this. The plain triple works auxiliary reservoir pressure alone to the brake cylinder. The quick-action triple is a valve of two parts; the plain part, when responding to a service application, works auxiliary pressure to the brake cylinder without the assistance of the other or emergency half. A quick reduction in the train pipe will cause both halves to go into action, when both train pipe and auxiliary reservoir pressure goes to the brake cylinder. The main reservoir stores pressure for releasing brakes and recharging auxiliary reservoirs. Train pipe pressure, when maintained, holds the brake off, but when reduced it allows the brake to apply. When increased above that in the auxiliary reservoir, it releases the brake.

Let the pupil trace the air from the time it enters the pump until it exhausts from the retaining valve. Avoid naming of ports in this instance, although it shows up to one's credit to be able to do it in that manner. . . .

In taking up the brake valve it would be best to make a comparison between the old three-way cock and the present equalizing discharge valve, showing the shortcomings of the former, and the advantages of and necessities for the latter. The three-way cock was designed to work straight air, but in lieu of something better it was used for some time, after automatic air was introduced, as a brake valve, with varying degrees of success. But the advent of the quick-action triple valve necessarily retired it. Instruction and intelligence has converted the old time champion of the three-way cock into a supporter of the engineer's valve, but the man is still in our midst who solemnly declares that the air-brake is too complicated and must be simplified.

If the air be drawn from the train pipe too slowly, the leakage grooves will allow the pressure, in going to the brake cylinder, to pass out around the piston to the atmosphere and be wasted away. If it be drawn too rapidly there is danger of the quick action ensuing when it is not desired. Thus it will be seen that the air must not be drawn too fast or too slow, but instead at a certain rate of speed which will be a medium between the two extremes. The engineer is thus placed between two fires; that of losing his air, or making a rough stop for which he will be censured. A skillful engineer can do very good work with the three-way cock if he carefully handles it; but no matter how well directed his efforts may be, a lurch of the engine, due to low joint or sharp curve, may cause him unintentionally to make a quicker reduction than was intended, and thus get the emergency. These facts alone are sufficient to demand a brake valve which will automatically do this work independent of the constant watchfulness of the engineer; but when we consider that an engineer's busiest time is when he is engaged in making a stop, and his attention must be divided between shutting off steam, dropping down his reverse lever, whistling for the station, trying the gage cocks, possibly putting to work an injector which has broken, looking out for persons and teams crossing the tracks, and bringing the train to a stop in the proper place to load and unload passengers and baggage, we see the demand for an automatic brake valve, which will, by a touch from the engineer, proceed to apply the brakes without further attention from him, thus lessening his work, instead of adding to it. This explanation will satisfy pupils of the advantages had from the use of the equalizing discharge valve, and may be followed up by an explanation of its construction and operation.

It will be best to explain that the engineer's brake and equalizing discharge valve is really a double valve, and composed of two separate parts; the service application part, by which the air is gradually reduced in the train pipe through the medium of the equalizing piston, which exhausts at the angle fitting in the bottom of the brake valve, and the emergency part, which suddenly reduces the train-pipe pressure, through the back of the valve, causing quick action. The equalizing feature of the valve should be first explained; how the pressure on the under side of the equalizing piston is train-pipe pressure, and can only get out in a service application of the brake by raising the piston, whereby the lower end of the piston stem, seating in the angle fitting and forming a joint, is lifted, and will permit the pressure to exhaust until it has reduced until lower than the amount remaining above the piston; and how the small reservoir pressure, to which the black hand of the gage is connected, is the pressure which is on the upper side of the equalizing piston, and must be reduced in order to allow the piston to rise and let a corresponding amount of pressure exhaust from the train pipe before it will reseat and close off the discharge. Opportunity should here be taken to explain that the exhaust from the train pipe will be long or short according to the length of the train pipe, and that no attempt should be made to stop the flow at the angle fitting, as it will take care of itself and close at the proper time, and any such attempt will result in the release of some of the forward brakes.

The practice of screwing a pipe in the angle fitting to carry away the sound of the discharge of escaping air from the cab to some point under the deck or outside of the cab should be discouraged, for the engineer should hear the sound, as it is a notification at all times of the length of train pipe which is connected up, and will serve as a tell-tale to him if there are any angle cocks closed, cutting off a portion of his train. Should the air escaping from the angle fitting blow out the water glass lamp or cause other inconvenience, the angle may be turned partly around by screwing or unscrewing, or a short pipe may be used; but it should never be carried out of hearing. So important to many engineers is this sound, that they can utilize it for telling very nearly how many cars they have coupled up.

In explaining the operation of the equalizing piston, and the differential pressures which actuate it, it will be seen that the pupil will catch the idea quite easily if he understands the operation of the triple valve, and the time on the triple, while being well spent in making the pupil familiar with it, will shorten that which would otherwise be required to place it before him in a light to be thoroughly understood. Explain that if you draw the amount from the black hand on the gage that is desired from the train pipe, and place the handle then on lap, the equalizing piston will draw a similar amount from the train pipe regardless of the length of the train. The engineer, by reducing the pressure on the black hand of the gage, orders the piston to make a similar reduction in the train pipe, and it goes ahead and does it. . . .

TECHNICAL.

Manufacturing and Business.

A report is printed that the Heath Rail Joint Co. is filling an order for rail joints for over 50 miles of track at the West Superior Iron and Steel Works.

The Glazier Headlight Co., of Rochester, has been incorporated to manufacture headlights, lanterns and sheet metal goods. The directors are: Elias C. Glazier, Nellie A. Glazier, Frank P. Siddons, John G. Platts and William H. Elliott, of New York City.

The firm of Joseph Edwards & Co., of New York, mechanical engineers and machinists, has been dissolved by the retirement of James R. F. Kelly. His interest has been purchased by Mr. Joseph Edwards, who will continue the business, with office at 414 Water street, New York.

The Manhattan Equipment Co., of 115 Broadway, New York, offers for sale a number of passenger cars in excellent condition. Two of the cars have a length of 50 ft. 8 in., with a seating capacity of 64. The inside finish is in maple and black walnut. Two other cars are 42 ft. long with Miller couplers and air-brakes, seating 54 and 51 respectively, the interior finish of one being in ash and black walnut, and of the other in maple and walnut.

The Egan Co., of Cincinnati, call attention to two of their new machines which have become popular in the lines for which they were designed. They claim that their 5½ band re-saw for splitting boards into thin stuff is rapidly supplanting the circular saw, and, on account of its simplicity, requires only ordinary skill to operate it. The automatic glue jointer is a new furniture making machine, which makes two accurate glue joints at one operation without danger to the attendant, and has already had a large sale.

The stockholders' meeting of the Joseph Dixon Crucible Co. was held at the company's offices at Jersey City on April 16. The directors reported that the business for the year had been satisfactory. Out of 7,345 shares of stock 7,215 were represented and were voted for the following directors: E. F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Joseph D. Bedle, Jerome D. Gillett. Mr. E. F. C. Young was elected President; John A. Walker, Vice-President and Treasurer; George E. Long, Secretary. The Dixon company was founded by Joseph Dixon in 1827 and organized as a stock company in 1868. Its manufactures are graphite products of all kinds.

A report from Master Mechanic Kearsley, of the New York & New England, of the performance of one of the engines equipped with the Smith exhaust pipe, makes a good showing of economy in coal consumption by the use of that device. On a 10-day test in March the engine ran 1,726 miles altogether, the average coal consumption being 56.20 lbs. for each mile run, or 35.59 miles to each ton of coal burned. The best record made with this engine before being equipped with the exhaust pipe was 27.52 miles per ton of coal burned. The exhaust pipes have recently been ordered by the Western of Alabama, the Baltimore & Ohio, and by the New York New Haven & Hartford, which now has seven engines equipped.

The New York Equipment Company, of 15 Wall street, New York, has just purchased from the Pennsylvania 50 first-class passenger and combination cars that have been running on the lines west of Pittsburgh. This is one of the largest transfers of second-hand equipment that has ever been negotiated in this country, and the buyers state that they were only induced to enter into a contract of such importance by getting advantage of figures would would enable them to offer these cars for resale in small lots at very low prices and, on easy terms on the car trust plan. The equipment company also have in stock a large number of locomotives and freight cars in good condition. They are prepared to completely equip a new road or add to the stock of an old road, and to do so at such prices and on such serms as purchasers seldom obtain.

Iron and Steel.

A Receiver has been appointed for the West Superior Iron & Steel Co. on the petition of the Northwestern Iron Co., of Milwaukee. The Superior Land & River Improvement Co. is the largest creditor of the steel company.

The Cambria Iron Co.'s steel rail mill at Johnstown, Pa., which has been in course of erection for nearly a year, is almost ready for complete operation. Its capacity is 1,500 tons every 24 hours. The capacity of the old rail mill was only 500 tons a day.

The Chester Pipe & Tube Co. has closed a contract for from 8,000 to 10,000 tons of iron pipe, of an aggregate length of 113 miles, for Western delivery. The iron for the pipes, it is stated, will be made by the Pottstown Iron Co., the Glasgow Iron Co. and the Potts Bros. Iron Co. (Limited), of Pottstown.

All departments of the Pottsville Iron & Steel plant at Fishback, Pa., will soon go on double turn. The steel department has been on double time for a couple of weeks to keep up with the amount of steel used by the mills in rolling channels and beams. The works are turning out considerable material for the Berlin Bridge Co.

The court has allowed the Receivers of the Pottstown Iron Co. to accept the terms of a plan of reorganization proposed by Cofrode & Saylor, incorporated, and the Reading Rolling Mills Company. The iron company is a creditor of the two corporations on promissory notes and open account, the indebtedness from the Cofrode & Saylor being $70,000, and from the rolling mills company over $5,000.

All the departments of the Pennsylvania Steel Works at Steelton, Pa., were in operation last week, with the exception of one branch of the merchant mill. Some large orders were booked and big runs made. Three furnaces are undergoing repairs, only one being in blast. Additional men have been employed in the frog, switch

and signal department, which is now on double turn, with plenty of orders ahead.

New Stations and Shops.

The Chicago & Southwestern Railroad has bought property south of Muncie, Ind., for a new station and shops. The present shops are at Lebanon, but are to be removed when the extension to Muncie is completed.

The Quebec, Montmorency & Charlevoix is about to proceed immediately with the construction of a new station on St. Paul street, Quebec, Que. Contracts have also been given out for the repairing of all the stations on the lines between Quebec and Ste. Anne de Beaupré.

Block Signaling.

The Long Island Railroad has closed a contract with the Johnson Signal Co. for the equipment of its main line between Long Island City and Jamaica, 10 miles, with block signaling apparatus with Patenall's electric locks.

The National Electric Headlight.

The National Electric Headlight Company, of Indianapolis, Ind., has lately furnished a number of its electric headlights for locomotives built by the Baldwin Locomotive Works for a railroad in South America. An order has also been received for 10 of these headlights from the Kansas City, Memphis & Birmingham. The Georgia Southern & Florida has recently put eight of them on its passenger engines. These lights are now running all the way between Chicago and Palatka, Fla., except upon one short road.

The Van Buren Street Tunnel.

The new tunnel of the West Chicago Street Railway Company under the Chicago River, which was illustrated in our issue of April 20, was formally opened on April 21 by the officials of the road and a party of invited guests. On the following day the tunnel was put into regular service, the Blue Island avenue and South Halsted street cable cars running downtown instead of transferring at Jefferson street, as they have done since being put in service.

Signal Patents.

The Union Switch & Signal Co. has filed suit in the United States Circuit Court at New York City against the Hall Signal Co., asking for an injunction and damages for alleged infringement of four patents on electric signal apparatus. The patents which it is claimed have been infringed are No. 233,746, issued Oct. 26, 1880, and No. 246,492, issued Aug. 30, 1881, to Oscar Gassett for improvements in electric signals; patent No. 227,102, issued May 4, 1880, to Oscar Gassett and Israel Fisher for a connector for electric track circuits; and patent No. 272,377, issued Nov. 6, 1883, to C. J. Means for improvements in electric signals.

The Hall Signal Co. has brought suit in the United States Circuit Court of western Pennsylvania against The Union Switch & Signal Co., of Swissvale, Pa., for alleged infringement of its United States patent covering an improved anti-lightning relay and circuit.

THE SCRAP HEAP.

Notes.

It is reported that the total amount of loss and damage incident to the collision at Kingsbury, Ind., in September last was $350,000 which the railroad company has paid.

An ordinance has been introduced in the Philadelphia City Council for the creation of a loan of $3,500,000 to be used in abolishing grade crossings on the Pennsylvania Railroad from Erie avenue to Front and Norris streets.

The savings fund which the Baltimore & Ohio Railroad maintains for its employees has been extended over the Pittsburgh & Western. The relief department of the Baltimore & Ohio has been in operation on the Pittsburgh & Western for some time.

An explosion of furnace G at the Edgar Thomson Steel Works at Braddock, Pa., last week, caused a damage of about $20,000, which it will require fully a week to repair. Two employees of the furnace were slightly injured, but there were several narrow escapes from loss of life.

On April 16, 27 freight brakemen of the Missouri Pacific at Van Buren, Ark., refused to work because the company reduced the number of men on each train from three to two. Since then numerous threats of a strike have been published, but it does not appear that anything serious came of them.

The Mobile & Ohio has notified its employees that a reduction of 8 per cent. in wages will be made on May 1. On March 1 the 8 per cent. taken off in November was restored, according to agreement, but the men were warned that in consequence of the dullness of business the reduction would probably soon be reimposed,

According to the New York *Sun*, 400 railroad ties were stolen from the Long Island Railroad at Glendale, N. Y. one night recently by a gang of Frenchmen. The sleepers were carried away in wagons and sold at ten cents apiece for firewood. Ten of the thieves were arrested and five of them pleaded guilty and were fined $5 each.

South American Notes.

The legislature of Córdoba has sanctioned the project of the Central Argentine Railroad for building a branch line from Pilas to Villa del Rosario.

Arrangements have been made whereby the Trans-Andine Railway may extend its tracks to form a junction with the Argentine Great Western Railway at Mendoza.

The Rio Claio São Paulo Railroad, Brazil, has just paid an additional dividend of 10 per cent. out of the earnings for 1893, making a total dividend paid for that year of 17 per cent.

Chili will have an international exhibition next September, to be held at Santiago. The electrical, mining and chemical industries, and mining and metallurgical products and processes are to be the chief features of the enterprise.

The Argentine Ministry of Marine has drawn up plans for the fortification of the Rio de la Plata, which will consist in part of steel turrets on submarine foundations. These fortifications will be erected at the narrow entrance to Martin Chico.

The British Honduras Mutual Fruit and Steamship Company (Ltd.), an English corporation, has been organized to put in operation a new line to ply between New Orleans and Belize. The steamers "Gambetta," "Coila," and "Aalesund" have been chartered and put in service.

The Pacific & São Francisco Railroad, Brazil, announces gross earnings for 1893 of $875,048 on a mileage of 77⅛ miles. The operating expenses amounted to $754,238. The bonded debt has been reduced by $62,208, standing now at $769,143. The traffic on this line is said to be increasing steadily.

As one result of the efforts of the Buenos Ayres Great Southern Railroad to build up the port of Bahia Blanca, the exports through that place reached $5,007,740 gold, and the imports $3,988,331, in 1893. This makes Bahia Blanca rank as the third port of Argentine, Buenos Ayres leading with a total inward and outward commerce of $131,723,000, and Rosario following with $24,943,000.

The Buenos Ayres Western Railroad reports gross earnings for the last half of 1893 amounting to $1,365,266, with operating expenses at $622,114, leaving a balance of $743,152, being $20,825 in excess of the net earnings for the corresponding period of 1892. The operating expenses for 1892 and 1893 were 43.31 per cent. and 45.57 per cent. of the receipts respectively, The length of this line is at present 403 miles, having been increased since 1892-93 from 338 miles.

A review of the traffic receipts on the principal Argentine railroads since Jan. 1, compared with those for the same period of 1893, shows the following percentages of increase or decrease of gross receipts:

	Miles open.	Increase per cent.
Central Argentine	746	6
Buenos Ayres & Pacific	426	12
Buenos Ayres Western	403	4
Entre Rios	379	10
Santa Fe & Cordoba Great Southern	186	20
		Decrease per cent.
Buenos Ayres Great Southern	1,398	½
Buenos Ayres & Rosario	911	4
Cordoba Central	686	18
Argentine Great Western	319	9

We have called attention to the gratifying increase of traffic receipts on the Uruguayan railroads, an improvement which would seem to be due largely to the increase of agriculture in that republic. From official statistics published by the Uruguyan Government it appears that the area under cultivation in 1892 was only 673,664 acres, which had increased to 871,364 acres in 1893. The number of separate estancias was 22,138, employing 45,000 men, an increase of 7,000 over 1892. The leading crops are wheat, corn, beans, barley and potatoes. The wheat crop for 1893 amounted to 2,009,711 hectoliters (5,703,359 bushels).

The report of the Bahia & São Francisco Railway Co., Brazil, for the half-year ended Dec. 31, 1893, shows gross traffic receipts amounting to $185,865, on a length of line of 76¾ miles. The expenses, including office expenses in London, were $250,789. The government guarantee of $490,785 for the half-year, which has been promptly paid, enables the stockholders to feel comfortable with a net income of $239,996. This road, which is one of Brazil's expensive luxuries of this class, represents an absorption of $113,943 per mile, which it is safe to say would have been much smaller had the line been built on a purely commercial basis. The company is pushing its extension to the upper navigable reaches of the Rio São Francisco, this prolongation being 345 miles, of which only a few leagues remain unfinished. The whole line will be brought into operation this year, and it may then begin to redeem itself. It will draw traffic not only from the territory through which it passes, but from an immense area in the interior by water transportation on the upper river above the falls.

Canal and Lake Freight Traffic.

The lake season of navigation opened on Lake Superior on Wednesday on the departure of the steel steamer Mahoning with 24,000 barrels flour for Buffalo. Far, however, from the usual rush is manifest. Last spring there were at one time in May on the way to Duluth 150 vessels, valued at over $25,000,000, mostly with cargoes; but now the fleet is very much smaller. None of the whaleback fleet of 30 vessels will start out till May. Freights are very dull. No charters are being made, and wheat room is held at 2¼ to 2½ cents a bushel, while ore and coal freights are respectively 80 and 25 cents a ton.

The steel ship Centurion, the largest freight carrier on the great lakes, took 35,000 bbls. of flour, or about 230 carloads, out of Lake Superior this week.

The Rockefeller syndicate is doubling the capacity of its iron ore dock at Duluth, giving loading room for from 16 to 20 of the largest lake vessels at one time. It is also building a very large diagonal yard near the dock with room for about 15,000 tons of ore in cars. It is understood unofficially that the company will handle a good deal more ore than has been expected.

The Erie Canal will be opened officially on May 1. The repairs are well in hand and will be completed about that time.

The Welland Canal opened on April 19 and six boats locked down. The lower levels, however, were not filled until the 22d, delaying quite a fleet of boats.

The St. Mary's Falls Canal opened on the 17th, three boats locking up that night. They left at 4:30 the next morning and arrived at Duluth on the morning of the 20th.

Chicago Enjoined from Disturbing Tracks.

The Lake Shore & Michigan Southern Railroad has been granted an injunction restraining the city of Chicago from interfering with its tracks at State and Sixty-third streets. This injunction was asked by the railroad company on account of the action of the City Council in passing an ordinance directing that 18 of the 20 tracks of the complainant at this point be removed by the proper municipal authorities. The claim is made by the city that the railroad company has never had authority to lay more than two tracks. The statement of the railroad company is in effect that a tract of land was purchased at this point some years ago for yard purposes; that the number of tracks crossing Sixty-third street and State street south of Sixty-third street is no greater than is necessary to properly connect the two parts of their yard, and that the construction and laying of tracks was a matter of common knowledge at the time it was done.

March Report on the Chicago Main Drainage.

The Treasurer of the Sanitary District of Chicago reports that the expenditures for March were $479,463.50, of which amount $260,457 was for land damages and $214,469 was for construction work. Chief Engineer Randolph reports that the levee on Section E will not withstand a flood, and has ordered the contractors to strengthen it at once. Mason, Hoge & Co. were ordered to do riprap work along their line.

The Lenoir Car Co.'s Shops.

The erection of the new shops of the Lenoir Car Co., at Lenoir City, Tenn., is now well under way and the company will be ready to begin car construction in a few weeks. Lenoir City is on the East Tennessee, Virginia & Georgia road, about 25 miles southwest of Knoxville. The officers of the car company are: W. P. Chamberlain, President; R. Z. Roberts, Vice President and General Manager, and L. A. Madden, Secretary and Treasurer.

The smithing and iron working building is of brick, 70 × 260 ft., with brick engine house attached and is now complete. The engine is in place and most of the machinery is on the grounds.

The wood working shop is of wood, 100 × 300 ft., well lighted and ventilated, with brick engine and boiler room, 64 × 66 ft. The boilers and engines are in place, and most of the other machinery is on the grounds.

The wareroom for general stores is 50 × 100 ft., with composition and gravel roofing, and brick floor.

The car wheel and car building plant are now under way. The wheel foundry is 92 × 454 ft., with two cupola rooms, engine and boiler rooms, and core oven rooms attached. This building is of heavy frame construction on brick foundations, sheathed with corrugated iron, covered with slate and thoroughly ventilated. The charging room will be floored with steel eye beams and ½-in. plates riveted thereto, and will be thoroughly equipped for car wheel making and general castings, the car wheel capacity being equal to 250 wheels a day.

The erecting shop is not yet constructed, but the foundation walls are up and most of the material is on the ground. It will be 120 × 300 ft., of wood, covered with composition and gravel.

Fast Time on the Lake Shore.

A special train, carrying Cornelius Vanderbilt and various other officers of the Vanderbilt system over the Lake Shore & Michigan Southern, ran from Cleveland to Erie, 95 miles, on April 17, in 95 minutes. A stop of four minutes was made at Ashtabula for water. From Collinwood to Saybrook, 42 miles, the time was 35 minutes, and from Kingsville to Dock Junction, 33 miles, the time was 28 minutes, equal to 70.7 miles an hour. The engine was a Brooks 10-wheeler, No. 188.

BRIDGE BUILDING.

Albany, N. Y.—The bill recently introduced in the New York Legislature by Senator Parker, of Albany, authorizing the New York Central & Hudson River Railroad to build a pile bridge over the Albany basin to Columbia street in the city of Albany, has passed the Senate. The bridge is to have a draw to admit of the passage of canal boats.

Allentown, Pa.—Viewers have reported in favor of building the bridge to connect this city with South Allentown at Fifth street. The structure will be 1,400 ft. long and cost about $100,000.

Alton, Ill.—The Alton bridge will be formally opened on Tuesday, May 1. The bridge was described in our issue of Dec. 15, 1893. It consists of eight spans, double track, viz.: six spans 210 ft. each, one of 360 ft. and one draw span of 450 ft. Mr. Lewis M. Loes was contractor for the substructure, and the Union Bridge Co. for the superstructure. Mr. George S. Morison is Chief Engineer and Mr. W. S. Macdonald Resident Engineer.

Attica, Ind.—The Chicago & Eastern Illinois, has contracted for a new bridge over the Wabash River at Attica. The stone abutments are to be rebuilt and the new bridge will be a combination iron and steel structure.

Baltimore, Md.—The ordinance granting permission to the Baltimore County Commissioners and Wyatt Owen to erect a free bridge over the Patapsco River to connect with Light street bridge, and to be provided with a draw, etc., has been made a special order for the next meeting of City Councils.

Mayor Latrobe has signed a resolution to appropriate $4,000 for the repair of the draw of the Block street bridge.

Carlisle, Pa.—An electric company is to bear one-third the cost of building a bridge 60 ft. wide over Letort Spring at East Pomfret street.

Cleveland, O.—The Cleveland, Lorain & Wheeling has awarded to the Toledo Bridge Co. the contract for building the steel bridges on its extension to Cleveland. There are ten plate girders and one deck truss.

Columbus, O.—"The New Columbus Bridge Co." has been incorporated by W. P. Hepburn, George H. Ganson, H. L. Rownd, C. G. Robbins and E. A. Angell, with a capital stock of $100,000.

Doylestown, Pa.—Residents of New Britain township have petitioned the commissioners to erect a bridge over the North Branch Creek on the road from New Galena to Newville.

Dubuque, Iowa.—A company is being formed to build a high bridge at Eagle Point, two miles above the present Dubuque bridge.

Duluth, Minn.—Bills have passed Congress in the past week allowing the Duluth-Superior Bridge Co. and the Duluth Transfer Railroad to build bridges between Duluth and Superior. The former is to be a steel bridge 23 ft. in the clear above water, about 1,000 ft. long, with wide draw and span for raft towing and is to have room for steam and street railroad tracks, foot passengers and teams. Work is to begin very soon. The latter will probably be a pile bridge with wide draw and raft span and about 4,000 ft. long. The Duluth Transfer Railway is building a very comprehensive system of terminal and connecting tracks at both Duluth

and Superior, and this bridge will complete its system and give every business and manufacturing section of the two cities access to all the others.

Elliottsburg, Md.—The County Commissioners have given the Vulcan Road Machine Co., of Charlestown, W. Va., the contract for a bridge over Bonnie Brae branch, on the road leading from Ilchester to Ellicott City. The contract price is $339.

Grantsville, W. Va.—The County Court of Calhoun County, W. Va., sitting at Grantsville, on last Thursday, passed an ordinance establishing two new bridge sites in the county, one at Arnoldsburg, over the West Fork River, and the other at Grantsville over the Little Kanawha River. It also passed an ordinance appropriating $18,000 to build the bridges, to be voted on at a special election to be held May 10. The bonds are almost sure to carry, as the court has been petitioned from all parts of the county to submit the question. The bridges are estimated to cost about $25,000, the remaining $7,000 to be paid out of the county's revenues. The bridge at Arnoldsburg will be about 100 ft. in length. The one at Grantsville will be over twice that length.

Guelph, Ont.—At the last meeting of the City Council the erection of a new bridge at Gows was agreed to. The estimated cost is $3,000.

Hamilton, Ont.—The Grand Trunk Railroad Company will erect a bridge across the canal at Hamilton Beach.

Hooversville, Pa.—Reviewers have been appointed in response to a petition of citizens who want a new bridge over Stony Creek at this place.

Islington, Ont.—Tenders are invited by Mr. J. D. Evans, Reeve, until May 7, for a steel bridge over the Mimico River on the Lake Shore road. Plans may be seen at the office of Mr. J. McDougall, Civil Engineer, Court House, Toronto.

Kemptville, Ont.—The work of building the new swing bridge here will be proceeded with by the Government at an early date.

New Bloomfield, Pa.—The County Commissioners have asked for proposals for the erection of a new bridge over the Sherman's Creek. Proposals will be received up to May 5.

Ottawa, Ont.—A steel iron bridge is to be erected in this city over the canal at Maria street. The estimated cost is placed at about $105,000.

Pittsburgh, Pa.—The Twenty-second street bridge bill has passed Congress, with an amendment requiring a 500-ft. span, and making the cost of the structure over $400,000. Director Bigelow says it will be built at once.

Point Pleasant, W. Va.—The County Court of Mason County, W. Va., has awarded to the West Virginia Bridge Co., of Point Pleasant, the contract for building a new wrought iron bridge, 100 ft. in length and 33 ft. in width over Salt River, in Clendennin district of that county. The West Virginia Bridge Co. is a new concern, recently established at Point Pleasant.

Portage-La-Prairie, Man.—A resolution has been passed by the Town Council recommending that steps be taken at once to secure the construction of a bridge across the Assiniboine River.

Renfrew, Ont.—Mr. James K. Rochester invites tenders until May 2, for the construction of a girder iron bridge over the Bonnechere River, in this village. Plans are at the office of Mr. J. L. Morris, Civil Engineer, Pembroke, Ont.

Royalton, Pa.—The citizens will petition the Pennsylvania Canal Co. to erect a bridge over its waterway at Shippen street.

Scranton, Pa.—Ordinances have been introduced in councils providing for a bridge over the Lackawanna at Linden street and another at Pittston over the Roaring Brook.

South St. Paul Belt Line Railway Co.—The proposition to vote $5,000 in bonds to aid in the construction by this company of a combination railroad and wagon bridge across the Mississippi River was defeated in the town of Cottage Grove. This leaves the amount of aid, voted by the town of Newport and the City of South St. Paul, $95,000. It is understood that the company will at once proceed with the work.

St. Boniface, Man.—The town proposes to build another bridge across the Red River and has asked the Winnipeg City Council to vote $10,000 toward the cost of construction.

Toronto, Ont.—Mr. Edmund Wragge is receiving tenders for the steel work, etc., required in the construction of a foot bridge through the present train sheds at the new Union Station. Plans at the office of Messrs. Strickland & Symonds, architects, 18 Toronto street.

The Commissioners of the Counties of York and Peel have decided to build a new iron bridge across the Etobicoke river at Silverthorn's, near Summerville. Plans are being prepared and tenders will be called for within two weeks by Mr. J. McDougall, Civil Engineer, Court House, Toronto.

York, Pa.—The Grand Jury has approved the report of the viewers recommending a bridge over the Codorus Creek, at Grantley street.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

A Wisconsin statute provides that every railroad corporation shall erect on both sides of its road (depot grounds excepted) sufficient fences, with openings and suitable farm crossings, and construct cattle guards at all highway crossings, and connect their fences therewith. The Supreme Court rules that a railroad company is bound to fence its track where it is crossed by a private logging railroad, by providing suitable guards or means to prevent domestic animals from going on its right of way, and is liable for damages to stock caused by its failure to do so.[1]

The Supreme Court of Georgia holds that under the statute declaring that a common carrier cannot limit his liability by notice either by publication or by entry on receipts given or tickets sold, though he may make an express contract, and will then be bound thereby, a stipulation in a bill of lading which exempts the carrier from liability unless notice is given of the damage within a specified time is not effectual without proof of assent thereto by the shipper, and such assent is not established by a mere acceptance of the bill.[2]

The Supreme Court of Texas holds that a railroad which permits combustible material to grow and remain on its right of way, where it is liable to be ignited by sparks from passing engines, is guilty of negligence as matter of law, and an instruction to this effect is not objectionable as being on the evidence.[3]

In Pennsylvania the Supreme Court holds that the fact that a railroad by agreement, with a manufacturing concern, made previous to the latter's organization, which agreement was an inducement to its organization, charges it less per ton for the transportation, from a certain point, of coal to be used for manufacturing purposes than it charges a dealer in coal for like transportation, does not constitute an "undue or unreasonable discrimination," within the meaning of the statute prohibiting such discrimination, since the charges are not for a like service from the same place, upon like conditions, and under similar circumstances.[4]

A North Dakota statute makes the killing of stock by cars or engines prima-facie evidence of negligence. Plaintiff having rested his case on said statute, and produced no other testimony of negligence, the engineer and fireman testified that, while running at dusk at 20 miles an hour, they saw a white object at the beginning of a bridge, outside the rails. The engineer supposed it to be a number board, but, when within 120 ft. of it, saw it was a horse caught in the bridge. The brakeman saw it at the same time and fairly corroborated the engineer as to distance. The engineer put the air on, reversed and used sand, making an emergency stop. Their testimony was undisputed. The Supreme Court rules that the court should have directed a verdict for defendant.[5]

Injuries to Passengers, Employees and Strangers.

The Supreme Court of Mississippi rules that the fact that a station agent, at the time he committed a tort, was at the time acting for another railroad company as well as defendant, does not affect the liability of the latter, but merely shows that such other company is also liable.[6]

In Mississippi plaintiff, at the time she was run into by defendant's train, was being driven in a private carriage, by invitation of its owner, the driver being the owner's son. The Supreme Court rules that no such relationship existed between plaintiff and the driver that the negligence of the driver could be imputed to plaintiff.[7]

The Supreme Court of Maine holds that a railroad cannot be considered negligent in the construction of a stone culvert which stood for over 40 years, but which was finally washed out by an unusual storm, the like of which had not been seen in that vicinity for 50 years.[8]

The Supreme Court of New York holds that where a railroad delivers a carload of lumber to the owner, it owes no duty to an employee of his contractor to provide against the danger of accident by the falling of the lumber while such employee is engaged, by direction of his employer, in unloading it from the car.[9]

In the Federal Court, plaintiff was traveling in a two-horse wagon toward a crossing, having his cap pulled down over his ears, and his overcoat collar turned up about them. A hedge and houses were between him and that part of the track on which a locomotive was approaching, and, at about 40 rods from the crossing, another locomotive, with steam escaping, stood on the track. The Texas law requires the locomotive whistle to be sounded at a distance of at least 80 rods from a grade crossing. The Supreme Court holds that it is erroneous to charge that the sounding of the whistle at a distance of more than 80 rods, so that a man of ordinarily good hearing, circumstanced as plaintiff was, would not have heard it, was not a compliance with the law.[10]

The Supreme Court of Florida holds that the engineer, fireman and brakeman of the same freight train are fellow-servants; and, in the absence of any statute imposing liability therefor, the railroad company is not liable to one of the brakemen for injuries sustained in consequence of the engineer's negligence in putting his unskilled fireman in charge of the engine.[11]

In Arizona it is held that a section foreman is not a fellow-servant of the conductor of a train on which he is being carried to and from the point on the road at which he is working.[12]

In Texas it is held that a car repairer at work on the tracks and the engineer of a switching engine are fellow-servants.[13]

In Georgia, in an action for the death of plaintiff's husband, a freight brakeman, there was evidence that he was killed by a low bridge, and that the "telltale," which should have warned him of the approach to the bridge, was not in order. He was, however warned by a fellow-brakeman as he approached the bridge, and it appeared that, when within 60 ft. of the bridge, he was looking toward it, it being broad daylight. The Supreme Court rules that deceased had a right to rely on the efficiency of the "telltale," and the question of contributory negligence on his part was for the jury.[14]

The Supreme Court of Virginia rules that where the conductor, of whose crew an engineer, fireman and brakeman formed a part, was present, and knew of and permitted the performance of the engineer's duties by the fireman, the company cannot escape liability for the death of the brakeman by the fireman's negligence, on the ground that the brakeman and engineer were fellow-servants.[15]

The Supreme Court of Mississippi rules that one working as fireman on a locomotive, with the permission of the railroad company, for the purpose of learning the business, is a fellow-servant of a train dispatcher employed by such company.[16]

In the Federal Court it is held that the conductor of a repair train on the main line of a railroad is a vice-principal with respect to the section foreman of a branch line who is injured by the conductor's negligence while riding on the repair train under orders from the superintendent to take all his section hands and assist in repairing the main line.[17]

In Tennessee the Supreme Court holds that the negligence of an engineer, who was a fellow-servant, in violating the time card of the company, was not the proximate cause of a collision whereby a brakemam was injured, where the negligence of the conductor in permitting such violation contributed to such collision.[18]

In Alabama in an action for injuries caused by a train going through an open switch, under a count in the complaint charging negligence on the part of persons in the employ of the defendant, who had charge of the switch, in leaving it open, there was evidence that the switch was provided with a suitable lock, and that the section foreman, conductors and engineers each had a key. The switch was used about 30 minutes before the accident, and the engineer then using the switch testified that it was properly secured before he left it. The Supreme Court rules that there was evidence to go to to the jury under such count.[19]

[1] Caldon v. C., St. P., M. & O., 55 N. W. Rep., 955.
[2] Cent. R. & B. Co. v. Hasselkus, 17 S. E. Rep., 838.
[3] Gulf, C. & S. F. v. Rowland, 23 S. W. Rep., 421.
[4] Hoover vs. P. R. R., 27 Atl. Rep., 282.
[5] Hodgins v. M., St. P. & S. S. M., 56 N. W. Rep., 139.
[6] Ill. Cent. v. King, 13 South. Rep., 824.
[7] Ala. & V. Ry. Co. v. Davis, 13 South. Rep., 693.
[8] Libby v. Maine Cent., 26 Atl. Rep., 943.
[9] Hulse v. N. Y., O. & W., 24 N. Y. S., 512.
[10] T. & P. v. Bryant, 56 Fed. Rep., 799.
[11] So. Fla. v. Price, 13 South. Rep., 638.
[12] McGill v. South. Pac. Co., 33 Pac. Rep., 821.
[13] T. & P. v. Cumpston, 23 S. W. Rep., 47.
[14] F. & W. v. Day, 17 S. E. Rep., 959.
[15] N. & W. v. Thomas' Adm'r, 17 S. E. Rep., 884.
[16] Millsaps v. L., N. O. & T., 13 South. Rep., 695.
[17] Union Pac. v. Callaghan, 56 Fed. Rep., 988.
[18] I. C. v. Spence, 23 S. W. Rep., 211.
[19] B. Ry. & E. Co. v. Baylor, 13 South. Rep., 793.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Baltimore & Ohio, semi-annual, 2½ per cent., payable May 17.

Boston & Maine, quarterly, 1½ per cent. on the common stock, payable May 15

Chicago, Burlington & Quincy, annual, Chicago, Ill., May 9.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 22.

Central of New Jersey, annual, Jersey City, N. J., May 11.

Dauphin & Berks, annual, Philadelphia, Pa., May 7.

Delaware & Hudson Canal, annual, New York City, May 8.

Dutchess County, annual, Poughkeepsie, N. Y., May 7.

Eastern of New Hampshire, annual, Portsmouth, N. H., May 1.

Elmira & Lake Ontario, annual, New York City, May 3.

Lake Shore & Michigan Southern, annual, Cleveland, O., May 2.

Michigan Central, annual, Detroit, Mich., May 3.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 16.

New York, Chicago & St. Louis, annual, Cleveland, O., May 2.

New York & Harlem, annual, New York City, May 15.

Norfolk & Western, annual, Roanoke, Va., May 2.

Omaha & St. Louis, annual, Stanberry, Mo., May 15.

Philadelphia, Harrisburg & Pittsburgh, annual Philadelphia, Pa., May 7.

Pittsburgh, Fort Wayne & Chicago, andual, Pittsburgh, Pa., May 16.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 4.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car Builders' Association* will hold its annual convention at Saratoga, N. Y., beginning June 12. The hotel headquarters will be at Congress Hall, H. S. Clements, Manager.

The *Master Mechanics' Association* will hold its annual convention at Saratoga, N. Y., beginning June 18.

The *National Association of Local Freight Agents* will hold its annual convention at Pittsburgh, Pa., June 12, 13, 14. The headquarters will be at the Monongahela House.

The *Association of American Railway Accounting Officers* will hold its next annual meeting at Willard Hall, Washington, D. C., commencing May 30.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month at 8 p. m. The annual convention will be held at the Cataract House, Niagara Falls, N. Y., beginning June 20.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas Place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 7:30 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo, on the second Monday in each month.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month at 8 p. m.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month.

The *Scandinavian Engineering Society of Chicago* meets in room 309, Title and Trust Building, 100 Washington street, on the third Thursday in each month.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

Iron and Steel Institute.

The annual meeting of the Iron and Steel Institute will be held at the Institution of Civil Engineers, 25 Great George street, London, May 2 and 3, commencing each day at 10:30 o'clock a. m. At the first session reports of officers will be read; the President, E. Windsor Richards, will deliver an address; the Bessemer gold medal for 1894 will be presented to John Gjers, Esq. The list of the papers that are to be read and discussed includes the following: On the Physical Influence of Certain Elements Upon Iron, by Prof. A. O. Arnold; on the Analysis of Steel, by H. K. Bamber, F. I. C.; on the Application of Electricity as a Motive Power in the Iron and Steel Industries, by D. Selby-Bigge.

The Civil Engineers' Club of Cleveland.

The club met at 7:45 April 11, 1894, President Swasey and 35 members present. President Swasey made some remarks introductory to his term of office and recommending that the club have some excursions to manufacturing establishments during the year. A letter was read from Mr. Wason, President of the Electrical Club, inviting the Civil Engineers' Club to visit one of the power stations on May 2, and the invitation was accepted.

Proposed amendments to the constitution were then taken up for discussion.

Professor Benjamin made some remarks upon the new issue of the *Journal*, and urged members to furnish short paragraphs on engineering subjects which might be published in it.

The President announced the death of two members of the club—L. L. Leggett on April 2 and C. B. Krause on April 3.

The paper of the evening was read by Mr. West, entitled "A Plea and Plan for Suburban Homes and Rapid Transit for City Employees," and was discussed by Messrs. Porter, Howe, Thompson and others.

Engineers' Club of St. Louis.

The club met on April 18, Vice-Prosideut Russell in the chair, 35 members and 10 visitors present. W. K. Hatt and G. W. Latta were elected to membership. An application for membership from E. W. Frederick, Superintendent Broderick & Bascom Wire Rope Co., was announced.

The committee appointed by the Engineers' C ub of St. Louis for the purpose of inaugurating the movement to establish boulevards reported that the committee, in co-operation with the committee appointed by the Society of Architects, has concluded to organize a committee of 60 to inaugurate the movement, the membership of the committee to represent the exchanges and mercantile organizations of the city.

Mr. R. E. McMath then delivered the fourth of the series of addresses on the "New Water Works," having special reference to the quality of the water supply. The general scheme of handling and distribution was explained. He stated that it was quite possible for Mississippi River water to reach the intake at Chain-of Rocks, but denied that this water was worse than Missouri River water. He showed the extent of pollution from Chicago sewage now existing, and the amount to be expected when the drainage canal is put into service. He called attention to the lack of value of analysis and other investigations of water supplies made heretofore, and urged an investigation of the entire subject by the general government as being free from all suspicion of local or other prejudicial influences.

The discuss on was very full, and was participated in by Messrs. Ockerson, Holman, Johnson, Ferguson, Macklind, Kineally, Seddon and Flad.

The Engineers' Club (New York).

That flourishing institution, the Engineers' Club, will celebrate quietly its fifth anniversary by a reception at its house next Saturday night. Considering the close interest which many of our readers have in this club, as members or as having often been entertained there, and considering its extraordinary success, it seems well to give a brief sketch of its history and doings.

The club was organized June 8, 1889, with 14 charter members, and incorporated in December of that year. At the first meeting of the organization the following officers and managers were elected: James A. Burden, President; Henry R. Towne and James C. Bayles, Vice-Presidents; A. C. Rand, Treasurer; David Williams, Secretary. Board of Managers: B. S. Church, Edward Cooper, Thomas Egleston, William Metcalf, J. F. Holloway, W. A. Perry, J. C. Platt, R. W. Raymond, F. S. Witherbee.

The premises now occupied by the club at 10 West Twenty-ninth street were leased and fitted up, and the house was opened April 29, 1889. The membership then was 204. At this meeting the Board of Trustees was increased to 20 by the election of C. E. Emery, Charles Macdonald, Andrew Carnegie, F. R. Hutton and Francis Collingwood. The standing committees which were appointed at that time included names well known among professional and business men. The Chairman of the House Committee was Mr. John Stanton, of the Membership Committee Mr. Theodore Voorhees, and of the Library Committee Prof. T. Egleston.

The Board of Managers had early issued a circular stating that "this club will be purely social in character and will have no meetings for papers, discussions or other scientific work, and will publish no transactions and compete in no way with existing scientific societies." We happen to know, however, that for a considerable time there was more or less jealousy of the young club felt and expressed by various members and officers of the engineering societies, and there was a good deal of skepticism as to its success; but the club has steadily grown, and the present membership is 341 resident and 306 non-resident members, including many of the most prominent engineers of the country in all branches, as well as manufacturers, besides whom there is a sprinkling of lawyers and other professional men. The last annual meeting showed a surplus of $11,532 in the treasury, with no indebtedness. This surplus has increased very handsomely since then.

The club has given a number of dinners and entertainments each year and extended courtesies to distinguished engineers at various times. For instance, in 1889 a complimentary dinner was given to the returning members of the excursion to Europe, who have now come to be known as the "eighty-niners," and whose visit abroad did so much to promote good feeling and close relations among the engineers of the United States and Europe. In October of that year a series of fortnightly subscription dinners was organized, these to be cheap in price and informal in the arrangements, and these grew to be popular beyond the capacity of the house, the tables overflowing into the café and smaller rooms. Mr. George W. Bramwell, now Secretary of the club, has been the Chairman of the Entertainment Committee from an early period, perhaps from the first, and has done a great deal to promote the success of these dinners and other entertainments.

Among the courtesies to distinguished engineers was a dinner to Chief Engineer Melville, U. S. Navy, at which he gave a thrilling description of the voyage of the Jeannette and the escape of the survivors of that unfortunate vessel. A dinner was given also to Chief Engineer Tomlinson, of the steamship Umbria, at which he described the breaking and repairing of the shaft of that vessel. Receptions have been given to the American Society of Mechanical Engineers and to the American Society of Civil Engineers and to the officers of the Army and Navy stationed in and around New York. In September and October of 1890 the club entertained many of the visiting members of the British Iron & Steel Institute and the Society of German Iron Workers. In January, 1891, a complimentary dinner was given to Chief Engineer Charles H. Loring, U. S. Navy, who retired after 40 years' of service. In October of 1891 a complimentary dinner was given to the English Columbian Commissioners; and in September, 1892, the famous dinner and reception to Mr. John Fritz was given at Bethlehem in celebration of his 70th birthday. This was organized and conducted by his fellow-members of the Engineers' Club. Other distinguished men have been entertained formally by the club and still others informally at the club by individual members.

We wish for the club and its guests a jolly evening next Saturday night and long life and prosperity and a handsome new house when the times will stand it.

Call for National Convention of Railroad Commissioners.

The sixth annual convention of Railroad Commissioners has been called to meet at the office of the Interstate Commerce Commission, No. 1317 F street, Washington, on May 8, at 11 a. m. The Railroad Commissioners of all states, and state officers charged with any duty in the supervision of railroads, are invited to attend. The Association of American Railway Accounting Officers is also invited to attend or send delegates to the convention, and join in the consideration of such questions of special interest to their association as may arise. At the last convention committees were appointed on the following subjects and directed to report to the next convention: Railway Statistics; Abuses Caused by Use of Shippers' Cars in Railway Equipment; Pooling of Freights and Division of Earnings; Uniform Classification of Freights.

Members of the convention are earnestly requested to prepare papers or suggest subjects for the consideration of the convention, and send such papers or suggestions to Secretary Moseley before the meeting, or lay them before the Committee on Order of Business to be appointed at this assembling of the convention. Members of former conventions are entitled to participate in the discussion of the coming meeting.

Association of Engineers of Virginia.

The regular monthly meeting was held in the rooms of the association in Roanoke, Va., on April 18, with the President, Mr. Charles S. Churchill in the chair. Owing to the absence of Mr. R. P. Patterson, who was to have opened the subject of "Blast Furnace Construction," the alternate subject, "Boiler Construction," was called and opened by Mr. G. R. Henderson. Mr. Henderson gave an interesting description of a modern boiler plant where a short stack with a fan was used to regulate the draft, instead of the usual very expensive stack, and where the fuel was not handled except by mechanical means after it was dumped by the transmitter until the ashes were let into the cart to be taken away. Mr. Henderson also described the latest designs of Water Tube Boilers. Noveltiesof details were also given, and among them a description of the serve ribbed tubes.

The next informal meeting will be held Wednesday, May 16. The subject for discussion will be "Photo Chromy" or "The Reproduction of Colors by Photography," opened by Mr. Rene de Saussme.

The Engineers' Club of Philadelphia.

At the meeting on April 21 papers will be read on "The First United States Pneumatic Postal System," by Authur Falkenau, and on "Desirability of Uniform Factors of Safety in Building Construction," by C. Henry Roney.

At the business meeting on April 7 President John C. Trautwine, Jr., in the chair, 118 members and visitors were present. The tellers reported the election to active membership of Messrs. Ira A. Shaler, Thomas H. Mirkil, Jr., H. M. Norris, Edward V. Maitland, Clayton W. Pike, William C. L. Eglin, C. B. Dahlgren, Stacy W. Kapp, Edwin F. Miller, Herbert G. Geer, James C. Hallsted and Josiah Harmer.

The Secretary read a communication from Mr. Albert Lucius, in which he comments on the recent discussion of plate-girders, expressing the opinion that for such plate-girders as those required for usual railroad bridges web-shears measured by the end-reaction should not exceed 4,000 lbs. per square inch, and web-plates should not be thinner than ⅝-in. The use and position of stiffeners, web-splices and rivets was also commented upon, and Mr. Lucius stated that, in his opinion, chord stresses might safely be taken at 12,000 lbs., excepting for short spans and stringers, where 9,000 to 10,000 lbs. is enough.

THE NIAGARA TURBINES.

Mr. Emile Geyelin read a paper describing the construction of the three turbines recently put in operation for the Niagara Falls Paper Co. While the turbines are supplied from a private tunnel belonging to the company, they empty into the great tunnel of the Cataract Construction Co., and the water from these turbines was the first to pass through the latter. The incline from the outlet of the great tunnel is at the average rate of one foot per hundred, and the total length is 6,200 ft. A smaller tunnel, seven feet interior diameter, ascends from the latter to the wheel-pit of the Niagara Falls Paper Company, which is about 800 ft from the banks of the Niagara River, 42 ft. long, 28 ft. wide, and 168 ft. deep, and admits of six turbines 1,100 horse-power each, under 140 ft. head of water. This pit, with its many pockets to receive girders, and the space for the tunnel, have been blasted out of solid rock.

Messrs. R. D. Wood & Co., of Philadelphia, were given a contract to construct and put into position three turbines of the above horse-power, the motion to be transmitted by means of upright shafts and bevel-wheels to three horizontal shafts running at 200 revolutions per minute. As only three wheels were to be installed at first, the penstock receiving the water from the head-race was made 13 ft. 6 in. in diameter, and is to be supplemented, when the other turbines are installed, by a second one 9 ft. in diameter When all these turbines are running there will be (including the wash-water used in the mill) a total flowage of 35,000 cubic feet per minute. Regarding the turbines, Mr. Geyelin stated that the inverted plan had been adopted in order, as far as possible, to counterbalance the great weight of the shafts and gearing by the upward pressure of the water. The speed of the turbines is 260 revolutions per minute, and the rims are made in bronze, are 4 ft. 8 in. in diameter, and have 30 apertures. In designing the superstructure, to hold the upright turbine shafts, heavy cast-iron girders were provided just above the turbines and just below the bevel gears. The bottom one is 30 in. deep and 18 in. broad, supported in the center by two columns. There are six intermediate girders of 20-in. wrought-iron beams in pairs, all being securely masoned and bolted into the rock. With a view to perfect rigidity, 10 in. was adopted for the diameter of the shafts, and 21 ft. for the distance between bearings.

In answer to questions, Mr. Geyelin stated that the wooden teeth had not been soaked in oil or paraffin, but that they were lubricated dry with a mixture of plumbago, tallow and a little sulphur, which keeps them at a bright polish. The highest previous record for bevel gears was 5,000 ft. per minute. Efficiency tests of the turbines have been made giving 78 per cent., a little lower than the wheels were designed for, on account of the increased weight of the construction. They are running 24 hours a day, and the bevel wheels are expected to last under this duty for about two years, without renewal.

Mr. E. M. Cook read a paper on Methods and Apparatus for Drying with Hot Air. After describing the methods of drying by exposure to the sun and wind, and by spreading on shelves in drying-rooms, provided with shutters to be closed during unfavorable weather, the various methods and apparatus for drying by the use of hot air were described. He pointed out that a serious defect in ordinary hot-air dryers is that the length of transit of the air over the material is insufficient to allow the air to become suitably saturated before its discharge, as is conclusively shown by the small difference of initial and discharge temperatures. The recirculatory system overcomes this difficulty, and by its use a run at any desired length may be had within reasonable dimensions, and the economy and capacity of the dryer may be promoted. This system, although covered in some of Sturtevant's earlier patents, does not seem to have been fully appreciated until recently.

PERSONALS.

—Mr. R. D. Carpenter, who was for some years Commissioner of the Associated Railways of Virginia and the Carolinas, has been appointed General Eastern Agent of the Richmond & Danville Railroad at New York City.

—Mr. H. W. Waldron, of Lancaster, N. H., Superintendent of the Northern Division of the Maine Central Railroad, has resigned that office, having accepted the position of Treasurer of the Portsmouth Electric Light & Gas Company. The resignation takes effect May 1.

—Mr. A. B. Stickney has been elected President of the Chicago Great Western Railroad to succeed John M. Egan, resigned. Mr. Stickney is also Chairman of the Board of Directors and has been at the head of what has become the "Stickney System" practically since it was projected.

—Mr. Samuel C. Stickney, who has been appointed acting General Manager of the Chicago Greatwestern, has been connected with that road and the Stickney terminal project in Chicago for a number of years. Mr. Stickney is an engineer of ability and has had considerable experience in other branches of the service.

—Gen. John C. New, of Indianapolis, formerly United States Treasurer, and United States Consul General at London, has been elected President of the Washington & Chesapeake Beach Railroad now being built. Mr. Job H. Jackson, of Wilmington, President of the Jackson & Sharpe Car Works, has been elected one of the directors of the company.

—Mr. L. M. Martin has resigned as General Manager of the Des Moines Northern & Western Railroad, Commercial Agent of the Wabash, and member of the Executive Committee of the Des Moines Union Railway, to become Vice-President and General Superintendent of the Lake Superior, Southwestern & Gulf Railroad. He had filled these positions since 1883.

—Mr. Henry T. Gallup, General Superintendent of the Boston & Albany, has handed in his resignation, to take effect May 1, and he will be succeded by Mr. William R. Robeson. Mr. Gallup retires on account of ill health. He is now 59 years old and has been in the service of the road 41 years. He began as brakeman on the Boston & Worcester, now a part of the Boston & Albany, was for many years passenger conductor, was agent at East Boston for six years and became General Freight Agent in 1880. He was appointed General Superintendent in 1886. Mr. Gallup was a man of exceptionally good qualifications for a railroad officer, while

at the same time his kindness of disposition endeared him to his associates and subordinates.

—Mr. William R. Robeson, who succeeds Mr. Gallup as General Superintendent of the Boston & Albany, with office at Springfield, Mass., has been Division Superintendent of the road at Albany for the past seven years. Previous to that he was in the Freight Department at Boston.

—Mr. John M. Egan has resigned as President and General Manager of the Chicago Great Western. Mr. Egan has not taken a vacation for the past 25 years and will enjoy a much needed rest. Mr. Egan served his time as a machinist, and, before he was of age, was graduated as a civil engineer. His career in that department of railroad service began in 1871 on the Northern Missouri, and from that road he went to the Southern Minnesota, now a part of the Chicago, Milwaukee & St. Paul. He became Superintendent of that road and continued in the position until 1880, when he accepted the position of General Superintendent and Superintendent of Construction of the Western Division of the Canadian Pacific. In 1885 he resigned and accepted the position of General Superintendent of the St. Paul, Minneapolis & Manitoba, now the Great Northern. During his incumbency the "Manitoba Extension," that part of the line from Minot, N. D., to Great Falls, Mont., was constructed, and it still stands as the record for rapid railroad building. In 1887 Mr. Egan was offered and accepted the position of General Manager of the Chicago, St. Paul & Kansas City. In 1891 he was elected President when the road became the Chicago Great Western, and retained the title and duties of General Manager.

The directors have passed resolutions expressing regret that Mr. Egan had decided to sever his connection with the company, and expressing in most complimentary terms their confidence in his abilities, and their respect for him as an official and as a man. It is doubtful if there is another man who has superintended the construction of as many miles of road as has Mr. Egan. As an organizer he has few equals, and his wide range of experience in the various branches of the railroad service pre-eminently qualified him to discharge the duties of the positions which he has held. He is an indefatigable worker, and has been blessed with good health and a most cheerful and bouyant disposition. His popularity has been so often attested that it has become a by-word wherever he is known.

ELECTIONS AND APPOINTMENTS.

Buffalo & Susquehanna.—S. W. Huston, of the Brooks Locomotive Works, has been made Master Mechanic of the Buffalo & Susquehanna at Austin, Pa., in place of L. T. Johnson, resigned.

Chicago Great Western.—John M. Egan, President and General Manager, having resigned, A. B. Stickney, chairman of the board of directors, has been elected President, and S. C. Stickney acting General Manager. Percy Lyons has been appointed Superintendent of Motive Power to succeed W. T. Reed, resigned.

Chicago & West Michigan.—The annual meeting was held in Grand Rapids, Mich., last week, and the following directors were elected: H. H. Hunnewell, A. H. Hardy, Charles F. Adams, George O. Shattuck, E. V. R. Thayer, Charles Merriam, Nathaniel Thayer, Charles M. Heald, and F. H. Damon.

Cincinnati, Saginaw & Mackinaw.—The annual meeting was held in Saginaw, Mich., April 18. The only change in the board of directors was the election of G. W. Stark to fill the vacancy caused by the death of F. C. Stone. The following officers were elected: President, A. W. Wright, Alma; Vice-President, L. J. Sergeant, Montreal, Que.; Secretary and Treasurer, James H. Muir, Detroit.

New York Central & Hudson River.—The annual election took place in Albany, N. Y., April 18. The following were the directors elected: Cornelius Vanderbilt, Chauncey M. Depew, Charles C. Clarke, Horace J. Hayden, William K. Vanderbilt, Frederick W. Vanderbilt, Samuel F. Barger, J. Pierpont Morgan, Samuel D. Babcock, of New York; William Bliss, of Boston; Sherman S. Jewett, of Buffalo; Erastus Corning, of Albany, and George C. Buell, of Rochester.

Ohio Valley.—The annual meeting was held in Henderson, Ky., April 17, and the following directors were elected: Samuel S. Brown, Pittsburgh; E. R. Robinson and C. S. Fairchild, New York; H. G. Kelsey and James Montgomery, Evansville, Ind.; Arthur Carey, Louisville, and Jordan Giles, of Sturgis, Ky.

Richmond & Danville.—R. D. Carpenter has been appointed General Eastern Agent of this road, with headquarters at 271 Broadway, New York City.

Staten Island Rapid Transit.—The annual meeting was held in New York City, April 24, and the following directors were elected: Charles F. Mayer, Thomas M. King, Orland Smith, C. K. Lord, Frank S. Gannon, C. J. Ryan, W. G. Atkinson, J. Frank Emmons, A. C. Rose, O. S. Wood, A. B. Boardman, James M. Davis and Louis De Jonge, Jr.

Terminal Railroad Association of St. Louis.—The Terminal Association has elected Dr. Wm. Taussig President; Julius S. Walsh, Vice-President, and James Hanna, Secretary.

Valley (O.).—The annual meeting was held in Cleveland, April 18, and the following directors were elected: C. F. Mayer, Thomas M. King and J. B. McDonald, of Baltimore; S. T. Everett, H. M. Keim, M. R. Dickey, J. E. French and J. K. Bole, of Cleveland, and L. V. Bockius, of Canton. The officers elected were: President, T. M. King; Vice-President, S. T. Everett, and Secretary and Treasurer, Henry M. Keim.

West Shore.—The annual meeting took place in Albany, N. Y., April 18, and the following directors were elected: Cornelius Vanderbilt, William K. Vanderbilt, Frederick W. Vanderbilt, Chauncey M. Depew, Ashbel Green, J. Pierpont Morgan, Charles C. Clarke, Edward D. Adams, Horace J. Hayden, Samuel F. Barger, J. Hood Wright, Charles Lanier and Charles Edward Tracy.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Allegheny & Butler.—A charter was issued at Harrisburg, Pa., last week to this company to build a line 50 miles long. The proposed road will be from Shaler Township, Allegheny County, thence through the townships of Shaler, Hampton and Richland, Allegheny County, and Middlesex, Penn and Butler township, Butler County, to the Butler borough. William I. Mustin, of Pittsburgh, is President. The directors are F. Gwinner, Jr., Edward W. Gwinner, William B. Rhodes and Charles K. Hill, of Allegheny County.

Atlantic, Suwannee River & Gulf.—The route of this road is described as from Starke, Fla., westwardly, crossing the Georgia Southern & Florida at Sampson City, southwest to La Crosse, Alachua County, thence to Alachua, on the S. F. & W., southwest to Osceola, west to Trenton, and thence to the Suwannee River. The road is in operation from Starke to La Crosse, a distance of 20 miles, and the permanent location has been made to Osceola. This extension it is expected will be built during the present year. No contracts have been let as yet, but the awards are to be made before June 1. No work is being done at present, as the permanent location has just been completed. The work is not difficult, the maximum grades being 50 ft. to the mile, maximum curves 4 deg. The officers are: President, Bion H. Barnett, Jacksonville; Vice-President, Comer L. Peek, Starke; Secretary, R. H. Liggett, Jacksonville; General Manager and Treasurer, Arthur Meigs, Jacksonville; Chief Engineer, George Tompsett, Starke.

Bangor & Aroostook.—Work on the extension from Houlton to Fort Fairfield, Me., will probably begin about May 1. Part of the line has been graded. The managers expect to have the road completed to Fort Fairfield by fall. As soon as the frost is entirely out of the ground the roadbed between Houlton and Island Falls will be fully ballasted. It is expected that passenger and express trains will run from Houlton to Bangor in four hours after the ballasting work is finished. The road has done a large business this winter.

Charleston & Savannah.—The construction of the St. Andrew's Branch of this road is now practically finished. It extends from John's Island Station to a point opposite the city of Charleston, in St. Andrew's Parish, and is about six and a half miles long.

Chicago, Burlington & Quincy.—The officers announce that the extension to connect with Northern Pacific at Billings, Mont., will be built this summer. The present terminus is Sheridan, Wyo., near the state line. The new line will extend northward along one of the branches of the Yellowstone line. The grade is easy and it is expected that the 120 miles will be completed in the fall. The contract for the grading has just been awarded to Kilpatrick Bros. & Collins, of Lincoln, Neb.

Chicago, Yankton & Southwestern.—A letter from one of the officers of this company states that the engineers are to begin the survey at Le Mars, Ia., on May 10. The line will be 68 miles long from that town through Westfield, which is the only town on the route to Yankton, S. D. The engineers are to follow a line surveyed some years ago by the engineers of the Illinois Central. The local projectors have secured the support of Chicago interests represented by R. A. W. Janes and announce that the railroad will be built this summer and in operation by November. A. K. Nash, who was Chief Engineer of the Yankton, Norfolk & Southwestern road, will have charge of the engineering work on this line. S. B. Coulson, of Yankton, is secretary.

Cleveland, Lorain & Wheeling.—This company is pushing work on its extension between Elyria, O., and Cleveland, and the line is to be completed into Cleveland by September. Tracklaying was begun on the Mallet Creek end last week. The company also has an extensive improvement under way on its Ohio River division between Bellaire and Martin's Ferry, O. This seven miles of road was built in 1885, nearly all of it on trestles along the Ohio River bank. Several construction trains are now employed in filling in this part of the road.

Conestoga Valley.—Engineers are now surveying for this proposed line south of Morgantown, Pa., which is to be the headquarters for the present. The road is to extend from Joanna, on the Wilmington & Northern, to Lancaster, following the Conestoga River from a point near Joanna all the way to Lancaster, about 25 miles. President H. A. Dupont, of the Wilmington & Northern, is interested in the construction of the road.

Delaware & Hudson.—The Secretary of War has ordered the railroad tracks which pass the government reservation at Plattsburgh Barracks to be removed. This will compel the Delaware & Hudson to lay a new track from Bluff Point to the Ausable branch, and the work has already been commenced.

Denver, Sioux City, Lake Superior & Chicago.—This company was incorporated in Denver last week by Denver men, members of the Chamber of Commerce. The purpose of this movement is the construction of a line from Niobrara, Neb., to connect with the Julesburg branch of the Union Pacific, Denver & Gulf.

Duluth, Mississippi River & Northern.—As stated in a previous issue this company has planned to build over 30 miles of branches and extensions in northern Minnesota. The line now in operation, about 28 miles long north of Swan River, Minn., on the Mississippi River, has been used chiefly as a logging line by the Swan River Logging Co. The new line, however, will reach a number of mines in the Mesaba Range. An extension of the main line about five miles long is now ready for tracklaying, and three miles additional is to be built this summer. The longest mine branch is 8½ miles, of which about half is ready for the tracklaying, and the entire eight miles is to be built this summer. A second branch to the mines has been located, but construction work will not be pushed further for the present. Williamson & Campbell, of Cornet, Minn., have the contract for a six-mile logging branch; and another logging branch 2¼ miles long is being built by the company's own forces. I. N. Gray, of Swan River, if the present Chief Engineer.

Erie & Central New York.—W. M. Meserole, of Brooklyn, and a party of engineers, arrived in Cortland, N. Y., last week to begin surveys for this road to Cincinnatus. The road will be built on the graded roadbed built more than 20 years ago by the Utica, Chenango & New York Railroad Co.

Florence & Cripple Creek.—The progress of construction of this line has been unprecedented in a mountainous country. Since January, 21 miles of track has been laid through canons where difficulties of engineering were great and the rockwork heavy. The remaining 14 miles will be completed probably by May 10. During this time 1,800 men have been employed upon the work. The road is now operated to Robinson, 17 miles from Florence, where connections are made with a stage line to the Cripple Creek mines. The canon is very narrow, and the difficulties from spring freshets had to be guarded against. At Robinson the road leaves the bottom of the canon and climbs the side of the mountain by means of the loop. The road here leaves the main canon going up East Eight-mile for a short distance at a four per cent. grade and follows around the side of the mountain for a mile and comes back opposite the point of starting but over 200 ft. higher up the mountain. In making the loop one gulch is crossed that requires a trestlework about 60 ft. in height. About four miles above, it strikes the stream again. There is one rock cut, four miles above Robinson, 200 ft. long, from which was removed 10,000 yards of material.

Lackawanna, Catskill Mt. & Boston.—The engineers on this proposed road have received instructions to begin work about June 1. One party will commence at Middleburgh, N. Y., and another at Delhi.

Lake Erie & Western.—The company is seeking to prevent the "Big Four" from crossing its tracks with a proposed belt line around Muncie, Ind. The state authorities have been asked to interfere, but have declined to do so.

Mahoning State Line.—This five-mile branch, running from Lowdville, O., to Hillsville, Pa., will be built the coming summer. It will tap immense deposits of limestone. One bridge, 200 ft. long, will have to be built.

Midland Terminal.—The company last week filed an amendment to its articles of incorporation providing for an extension of the road from Cripple Creek to South Canon City and to Florence, Col. Some surveying has already been done for this extension, as reported last week.

Millersburg, Jeromeville & Greenwich.—This company was incorporated this week at Columbus, O., the purpose being to construct a road from Wooster, O., on the Cleveland, Wooster & Muskingum Valley road, to a point in Greenwich township, Huron County, on the line of the Akron Division of the Baltimore & Ohio road, and passing through Wayne, Ashland and Huron counties. The incorporators are A. B. Camp, H. Thompson D. Flemly, Daniel A. Munroe and Rolin Germain.

Northern Central.—Smith and Campion, of Mahanoy City, Pa., began work on the new branch April 23. This branch will begin at Brady, near Shamokin, and will extend three miles to the Scott colliery of the Union Coal Company.

Philadelphia & Delaware County.—President Roberts, accompanied by several other officials of the Pennsylvania Railroad, made an inspection of this branch last week. The new line extends from Fernwood, near Philadelphia, on the Baltimore Central road, to Newtown Square. It is practically completed as far as Bryn Mawr avenue. The completion of the rest of the work is but a matter of a few weeks. No definite time for the opening of the road has been fixed upon, nor have the stations along the road been determined upon.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The New Cumberland extension from Wheeling Junction, W. Va., by way of New Cumberland, to a point opposite Willsville, Ohio, was completed last week, and trains are now running. The extension is 28 miles in length. There are four steel bridges and several trestles. It is reported that this branch, which is the property of the Pennsylvania company, is to be connected with the Cleveland & Pittsburgh at Wellsville, Ohio, by a bridge over the Ohio River, thus shortening the run to Pittsburgh.

Rice Lake, Dallas & Menominee.—Engineers are now in the field making a preliminary survey from Cameron Junction to Menominee, Mich., a distance of 37 miles. The first seven miles of the road, from Rice Lake to Cameron Junction, was completed last year.

South Brooklyn Terminal.—The Brooklyn aldermen have granted the South Brooklyn Terminal Co. a franchise to build across the lower part of the Twenty-sixth ward, in the city of Brooklyn, to Jamaica Bay. The plan appears to be to parrallel portions of the Long Island road.

Tilsonbury, Lake Erie & Pacific.—This company is asking a bonus from the Dominion Government of $2,000 a mile for 16 miles of the road from Tilsonbury, Ont., to Lake Erie.

Washington & Chesapeake Beach.—A report from Chief Engineer L. H. Hyer, of Washington, D. C., states that the entire road between Washington and Chesapeake Beach, Md., 27 miles, is now covered with the grading forces of the contractors. The pier at Chesapeake is built out over 800 ft., and the pile driving at the Patuxent River crossing will begin this week. Coffin, Sullivan & Co., of 50 Broadway, New York City, are the chief contractors, and their contract also includes the grading of the company's property at Chesapeake Beach. Gen. John C. New is President, and Capt. A. H. Mattox, of Washington, is the General Manager.

GENERAL RAILROAD NEWS.

Baltimore Belt.—A second mortgage for $2,500,000 was executed in Baltimore on April 23. The Mercantile Trust & Deposit Co., of Baltimore, is the trustee under the mortgage. The bonds are to bear 4½ per cent. interest. It is explained that the difficulties encountered in construction and the high price paid for much of the right of way have increased the cost of the road beyond the engineer's estimates. The stations along the line are still to be built, and the cost of these will be considerable, especially as the station at Lombard and Howard streets and the one on the Bolton lot will be partly under ground. The work on these buildings has not yet been begun, although the plans have been prepared. The first mortgage on the Belt property is for $6,000,000, bearing interest at 5 per cent. a year, and was executed in 1890.

Columbus, Hocking Valley & Toledo.—An officer of the company makes a statement in regard to the recent suit brought in Ohio by the Central Trust Company of New York against Stevenson Burke and others, that it is the outcome of the decision of the General Term of the Supreme Court in New York, that the Central Trust Co., as Trustee of the first consolidated mortgage of the company, was charged with the duty of using reasonable diligence to compel Burke and associates to turn over the proceeds of $8,000,000 bonds secured by the mortgage, to the end that the railroad company may in its turn be required to apply those proceeds to improve the mortgage security, as provided in the covenants of the mortgage. The railroad company and its present officers are made defendants in the suit only in order that they may receive the proceeds of the bonds from Burke and associates, and use them for the equipment and improvement of the railroad.

Lake Erie, Alliance & Southern.—This road, which extends from Alliance to Bergholz, O., a distance of 40

miles, is to be sold by the Receiver on June 4, under an order issued in the suit of the Central Trust Co., of New York. The road does a paying business, but the rolling stock and roadbed are not in very good condition.

Leavenworth, Topeka & Southwestern.—C. T. McClellan, of Topeka, has been appointed Receiver of the road, recently abandoned by the Union Pacific, and Atchison, Topeka & Santa Fe, with power to operate the road to such an extent as the earning will pay operating expenses, pending foreclosure of first mortgage by the American Loan & Trust Co., of Boston.

New York & New England.—William T. Hart and F. J. Kingsbury, second mortgage bondholders of the railroad, petitioned the United States Circuit Court that some of the leased lines be dropped. Receivers Platt and Perry declared that it would be for the interest of the property to retain the leased lines. Judge Wallace gave his opinion last week and said that it would be injudicious for the Receivers to permit at the present time any of the leased lines to be lost by the non-payment of rentals and forfeiture of the leases. It is manifestly the best policy for the Recivers during the short time which will intervene before the second mortgage bondholders will be entitled to enforce their legal rights, to maintain the property which has come into their hands in its original integrity.

Richmond, Nicholasville, Irvine & Beattysville.—Bondholders have arranged to purchase the road at foreclosure sale and to extend it 36 miles to Beattysville, Ky., through a rich mineral and timber region. The Central Trust of New York holds a majority and the Louisville Trust a part of the $2,375,000 bonds.

Sioux City Terminal.—A bill of complaint was filed in the United tates Court in Sioux City, Iowa, last week by the North American Trust Co., asking a decree of foreclosure of $1,250.000 bonds against the Sioux City Terminal Railway & Warehouse Co.'s track, stations and property in Sioux City, because of a default in the payment of January interest.

Southern Railway Company.—It was announced this week that the Reorganization Committee of the Richmond & West Point Terminal Railway & Warehouse Co. have decided to name the successor company "The Southern Railway Company."

St. Louis, Alton & Terre Haute.—In the annual report recently issued, Chairman George Foster Peabody states that the directors are now preparing a readjustment of the securities in connection with the cancellation of the mortgages and the settlement of the arrears of dividend accrued upon the preferred stock, which on July 1 will aggregate 31¾ per cent. It is their hope to soon be able to propose a plan which will be equitable to all interests, whereby the stockholders of both classes can arrange for an early adjustment of the preference stock dividends and the retirement of the dividend bonds at a suitable discount for the period (probably several years), which would elapse before the arrears on the preferred stock could be liquidated in the ordinary course from future earnings, and a surplus be left for them. Such plan should also provide means for securing the money, when needed, for the moderate additional capital requirements referred to by the President.

Toledo, Ann Arbor & North Michigan.—Two boards of directors were elected last week in Toledo, O. The annual meeting was called for April 20, but the vote for directors was not begun on that day before six o'clock, when one of the two factions contending for control of the property withdrew from the meeting. On April 21 the representatives of the bondholders' committee elected the following directors: Amos N. Eno, John Jacob Astor, George N. Quintard, Edward Simmons, Robert M. Gallaway, Ernest Dickman, H. Livingston Rogers, Alfred de Cordova, Charles E. Quincy, T. W. Childs and E. S. Kissam. The three examiners appointed by the court certified to this election and Receiver Wellington R. Burt, Chairman of the meeting, recognized the directors so elected as the legal directory. The board afterward organized by the re-election of Amos F. Eno, President; John Jacob Astor, Vice-President; F. S. Chandler, Secretary; and D. C. Tate, Assistant Secretary and Transfer Agent. The stockholders' committee proposed the following as directors and they report that 30,517 shares of stock were voted for their election as directors on April 20. James A. Blair, William Martens, George W. Murray, George R. Sheldon, Joseph Walker, Jr., Thomas C. Platt, E. P. Goodwin, G. K. Clark, Jr., George N. Crouse, of New York, and William M. Green and Edwin J. McMonigal, of Ohio. The bondholders' committee claim that 31,499 shares were voted for the directors nominated by them.

Toledo & South Haven.—This railroad was sold at public sale at Kalamazoo, Mich, on April 21, to Howard Mansfield, representing the Farmers' Loan & Trust Company, the bondholders, for $100,000. The road is 37 miles long, from Lawton to South Haven, Mich.

Toledo, Peoria & Western.—The negotiations which have been in progress for some time by which the Chicago, Burlington & Quincy Railroad Company purchases a half interest in the Toledo, Peoria & Western has practically been settled, as only the signing of the contracts is necessary for the consummation of the sale. The other one-half interest in the road is owned by the Pennsylvania Railroad Company.

Union Pacific.—E. Ellery Anderson, one of the five Receivers of the Union Pacific, appeared by invitation before the House Committee on Pacific Railways at Washington, last week, and explained at some length the relations of that company to the Government, the status of the Government's claim against it, and other matters of collateral interest. Some equitable reorganization looking to the protection of all of the interests connected with the road was the only thing, in his judgment, to be done. Mr. Anderson, in reply to a question as to whether the Union Pacific had made any provisions for meeting the debts of the United States, and whether it had a specific fund for that purpose, replied in the negative.

Union Pacific, Denver & Gulf.—Ex-Governor John Evans has filed a petition in the United States Court at Denver, asking that the recent election of directors of the Union Pacific, Denver & Gulf Railroad Company be set aside. The petition requests that a new election be ordered at which Union Pacific holding of stocks cannot be voted.

Vancouver, Klickitat & Yakima.—The transfer of this property from the local company was made last week to New York capitalists who have become interested in the enterprise. As recently stated, the present line is about 15 miles long north of Vancouver, Wash., but the new owners intend to extend it farther north to connect with the Northern Pacific road.

TRAFFIC.

Traffic Notes.

The Erie Canal is to be opened on May 1.

The steerage rate for passengers by the Anchor Line between Glasgow and New York has fallen to $22, and other lines are said to be offering tickets at $18. Rates from other ports are also low, the recent conferences of the steamship lines about an agreement to maintain rates having come to naught.

An electric street railroad was opened between Newark, N. J., and Jersey City on April 21, and special through cars are run, making the trip in 50 minutes. The fare is 10 cents, including a ferry ticket to or from New York. The Pennsylvania Railroad appears to be interested in this line and the prospective competition between the street car and the steam railroad lines appears not to be alarming.

General Managers of the Cincinnati and St. Louis lines are endeavoring to form an auxiliary association, or rather increase the scope of the Cincinnati-St. Louis passenger association, to take in all freight and passenger traffic; working in harmony with the Joint Committee of the Central Traffic and Trunk Line Associations The reorganization of the Chicago & Ohio River Association is also contemplated.

The legal proceedings instituted by the New York & New England against the New York, New Haven & Hartford, on account of the refusal of the latter to advance money to the New England road on interchanged freight, remain unsettled. The petition in this case, which came before Judge Colt, of the United States Circuit Court at Boston, was dismissed by him on the ground that the question did not come within his jurisdiction, but the decision was without prejudice to the Receivers to bring a new bill.

A "National Grain Congress" met at Wichita, Kan., April 17. It was attended by grain men from southern Kansas and Oklahoma, Louisiana, Texas, Arkansas, Nebraska, Colorado, Florida, Alabama, South Carolina, Iowa and Minnesota. The object of the congress was to secure an outlet for Southern and Southwestern products on the Gulf of Mexico. The New Orleans delegation was strongest. A permanent organization was effected as follows: President, G. W. Clement, of Wichita; Secretaries, Colonel West, of Alabama, and A. C. Jones, of Kansas.

The Pacific Mail Steamship Company has received notice from the Panama Railroad that the road will not exercise its option of renewing the present contract after June 15. Under that contract the Panama Railroad chartered three steamers of the Pacific Mail between New York and Colon at $12,000 a month. The Pacific Mail has not decided what it will do after June 15, but it is said that it will probably resume its former service. There has been an advance of about 40 per cent. in freight rates between Panama and San Francisco, but rates continue unchanged between New York and Colon.

Chicago Traffic Matters.

CHICAGO, April 25, 1894.

Interest in traffic matters this week centers around the war between the Western Passenger Association and the Union Pacific over immigrant business. The Association lines finally decided that to inaugurate a war of commissions would not cure the evil, and determined upon heroic treatment. They thereupon announced a rate of $16.10, Missouri River to California points, effective April 22. This rate is the Southern Pacific's proportion of the Missouri River-California rate, and gives the Union Pacific nothing on the existing proportions. Eastern lines promptly accepted this rate as a basing rate, making the through rate $39 35 from New York to San Francisco. Without the assistance of the Southern Pacific or Northwestern the Union Pacific must carry all this traffic from the Missouri River to Ogden for nothing, and pay commissions beside. There is, of course, $12.50 for the haul from Chicago to the Missouri River, from which the Northwestern might contribute to the Union Pacific, but this is not considered as a possible contingency. Upon the announcement of this action the Western lines were astonished at receiving notice from the Southern Pacific that it would demand its full locals west of Ogden on all the business—$25 on San Francisco, $35 on Los Angeles and $40 on San Diego. This was the more surprising, as the chairman while in New York had kept the Eastern agent of the Southern Pacific fully advised of the intended action, and the latter had not intimated that his company would not accept the rate. If the Southern Pacific can maintain this position it will force the Western lines to either advance the rate to $25 west of Ogden, in which event the Union Pacific will presumably receive its regular proportion of 46 per cent. of the Missouri River-San Francisco rate, thus largely nullifying the effect of the action of the other lines, or else the other lines must pay the difference between $16.10 and $25 out of their earnings between Chicago and the Missouri River. They are determined, however, to maintain the $16.10 rate, and profess to believe that the Southern Pacific will rescind its notice and accept the $16.10. In the event of a refusal, they think they can force it to accept the usual percentage basis. Just what shape the situation will assume remains to be seen. All the other lines are extremely bitter against the Union Pacific and are determined to settle the commission question once for all, if it can be done.

In the mean while Immigrant Agent McDonald is threatening suit against the Association for breach of contract and non-payment of commissions, and is reported to be offering $2.50 commission on the reduced rate.

In the event of retaliation by the Union Pacific by cutting first-class rates, the Santa Fe stands ready to again reduce the Chicago-Missouri River rate, as well as the Missouri Pacific-California rate. The impression is that the Southern Pacific is endeavoring to hold the rate as high as possible in order to keep up its rates via the Sunset route, but that rather than antagonize all its connections except the Union Pacific it will accede.

The General Passenger Agents of Central Traffic Association lines did nothing last week except prepare suggestions for submission to the joint committee at the meeting in New York this week. It is conceded that it is useless to propose any more plans for handling eastbound passenger business until the lines agree upon some sufficient forfeiture for infractions of the agreement. As a matter of fact, none of the plans proposed is any better than the one under which work was begun a year ago, and which failed because the lines would not carry out its provisions when it came to an actual division of the business.

No settlement of the differences between the Eastern and Western lines over exchange orders has yet been reached. The Eastern associations are complaining that the action of the Western lines in stocking the market with these orders is seriously disturbing their westbound agreement, and threaten to retaliate by routing everything over lines not putting out the orders. The Western lines say they will maintain the position they have taken until the trunk lines stop inserting the Canadian Pacific differentials in their rate sheets; that they can take care of their business without the co-operation of the trunk lines if necessary, and that their interests are mutual.

The Southwestern lines are complaining that the Missouri Pacific is taking an undue share of the eastbound grain in the face of an agreement among all the lines for a division of this business from Kansas and Missouri River points to St Louis and Chicago.

The Alton has given notice that it will not meet the competition of the Santa Fe on land excursion business to Santa Fe stations in Texas. The competition to lower Missouri River points will continue to be met.

Representatives of the Pennsylvania and Lehigh Valley have agreed on westbound lake and rail rates 5 cents per 100 lower than all-rail rates.

An attempt is being made by the Eastern lines to enter into a supplementary agreement between the passenger agents that on all party business to which their lines are terminal they will amicably agree on rates and distribution of territory, and maintain them against outside competition from connections. There is always a strong pressure made by connections desirous of initiating this business, to secure concessions from the terminal lines, which will enable them to shade agreed rates made by association lines, and it is recognized that only by harmonious and concerted action on the part of the terminal lines can rates be maintained.

The Chicago & Eastern Illinois has followed the Chicago & Grand Trunk in adopting a simple common-law form of bill of lading, and will in future substitute it for the uniform bill of lading called for by the official classification. The tendency of all the Eastern roads is in the same direction, and already on many of them the uniform bill of lading is not insisted on if the shipper objects strongly. Shippers are hopeful that all the objectionable features of the official classification will soon be rescinded.

The Atchison, Topeka & Santa Fe last week gave notice to the Western Passenger Association that in consequence of the repeated purchase of eastbound tickets, over Association lines, from ticket brokers in Colorado at cut rates, the Santa Fe rates from Pueblo, Colorado Springs and Denver would be no higher than charged by ticket brokers or ticket agents for new and unused tickets of the issue of the initial line.

Lake business was dull last week, the Grand Trunk taking nearly all the New England grain via Port Huron on a lake rate of 8¾ cents a bushel against a rate of 8½ cents via Buffalo.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending April 21, amounted to 64,663 tons, against 82,938 tons during the preceding week, a decrease of 18,275 tons, and against 63,699 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Apr. 21.		W'k to Apr. 14.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	7,539	11.7	10,806	13.0
Wabash	8,778	13.7	14,517	17.5
Lake Shore & Michigan South.	8,339	12.8	8,457	10.2
Pitts., Ft. Wayne & Chicago	5,795	8.9	7,079	8.5
Pitts., Cin., Chicago & St. Louis	11,122	17.2	13,806	16.6
Baltimore & Ohio	2,532	3.9	3,966	4.8
Chicago & Grand Trunk	6,010	9.3	7,555	9 1
New York, Chic. & St. Louis	5,603	8.7	7,789	9.4
Chicago & Erie	7,388	11.4	7,539	9.1
C., C., C. & St. Louis	1,557	2.4	1,424	1.8
Totals	64,663	100.0	82,938	100.0

Of the above shipments 3,743 tons were flour, 28,862 tons grain and millstuff, 9,494 tons cured meats, 13,232 tons dressed beef, 1,063 tons butter, 1,428 tons hides and 5,035 tons lumber. The three Vanderbilt lines carried 33.2 per cent., the two Pennsylvania lines 26.1 per cent. Lake lines carried 85,192 tons, against 49,806 tons last week.

(*Other Chicago traffic news will be found on page* 308).

The Interstate Commerce Commission.

The Commission has issued a decision, prepared by Commissioner Veazey, in the case of A. S. Page and others against the Delaware, Lackawanna & Western, the New York Central and the Michigan Central railroads, which concerned the classification of window shades and hollands, complainants being large manufacturers of shades at Minetto, N. Y., near Oswego. The decision is summarized by Commissioner Veazey as follows:

1. Where it appears that a complainant has invoked the aid of the law for the purpose of securing what he, with the acquiescence of the carrier, had previously obtained in apparent contravention of the law, such acquiescing carrier will not be held entitled to plead violations of the law by complainant in bar of a decision on the merits, nor will the individual interests of the complainant be taken into consideration; but the Commission will examine the evidence and make such report thereon as, under the provisions of the law, the rights of other shippers and the public generally may require. If, independently of any action or interest of complainants, the conduct of defendants with reference to the transportation which is the subject of the proceeding is shown by the evidence to be unlawful, it is the duty of the Commission to execute and enforce the statutory provisions applicable thereto.

2. Upon consideration of the great reduction which has taken place in the value of window shades, the arbitrary increase of shade classification by the carriers during the progress of this proceeding, and all the other facts and circumstances herein which pertain to the rights of shade shippers and consignees generally, and of purchasers of that article of household necessity, *Held*, That the classification of window shades as first class in the Official Classification has become unjust, and that the legal duty of defendants to so classify traffic and fix charges thereon that the burdens of transportation are reasonably and justly distributed among the articles they carry requires them to reduce their classification of window shades to the class which, under the Official Classification, is now applied to "window hollands and shade cloth, plain, uncut and undecorated."